AN ABSTRACT OF THE THESIS OF

James P. Hogan for the degree of Doctor of Philosophy

in Education presented on April 29, 1981

Title: The Achievement Effect of Behavioral Objectives in Introductory Psychology



Abstract approved: Carvel Wood

Purpose of the Study

The purpose of this study was to investigate the achievement effect of providing students in a college-level introductory psychology course with behavioral objecives. The non-experimental literature provides a rationale for student use of behavioral objectives (Bobbitt, 1918; Tyler, 1950; Taba, 1962; Gagne and Briggs, 1974; and Popham, 1969). A number of other authors provide logical arguments against their use (Eisner, 1967; Atkin, 1968; Ebel, 1970). The empirical studies completed show the same divergence. Some studies demonstrate a significant difference in favor of the use of behavioral objectives, while other studies do not. Specific recommendations for more effective use of behavioral objectives have been made: providing the opportunity for students to practice

the objectives (Tyler, 1950), placing the objectives within a cognitive taxonomy (Bloom, 1956), and establishing in the mind of the student the association between the objecitves and the tests (Tiemann, 1968). In addition to these recommendations applicable to the learning situation itself, Scriven (1977) recommends the use of a test item pool referenced to the objectives. Melton (1978) recommends that the objectives meet the criteria of being clearly written, readable, specific as to the behavior required and of moderate difficulty.

An experiment was designed incorporating these recommendations to test the following null hypotheses at $\alpha = .05$.

1. There is no significant achievement difference between those students receiving behavioral objectives and those receiving placebo treatments.
2. There is no significant achievement difference between groups taught by different instructors.
3. There is no significant interaction of instructor and treatment.

Procedures/Findings

Subjects for the study were 259 students whose high school grade point averages were on file with the university and who registered for and completed Psychology 201 at Oregon State University during the ten-week winter term, 1981. These students were randomly assigned to one of three treatments: behavioral objectives, weekly outlines, and study guides. Copies of these are included in the appendices. The dependent variable was a 100-item final examination constructed from the test item pool provided by the publishers of the supplemental Study Guide (Atkinson, 1979). While no validity data were available for the dependent measure, the discrimination and difficulty indices indicate that the test was of moderate difficulty and that 98 of the 100 items discriminated between high and low scorers at $\alpha = .01$. The reliability score as computed by the K-R 20 was .911. The examination and item analysis

data are included in the appendices.

All data were collected by the investigator. Analysis of covariance (ANCOV) with high school grade point average as the covariant was used to test all three hypotheses. All three null hypotheses were retained. There were no significant differences due to treatment or instructor.

## Conclusions

The literature indicates that behavioral objectives may be a useful experimental method for increasing achievement when the recommendations for more effective use of behavioral objectives are incorporated into the design. Although the null hypotheses have been retained, the adjusted treatment means (69.30 for behavioral objectives, 67.67 for study guides, and 67.80 for course outlines) indicate that behavioral objectives, while increasing achievement, did not increase achievement significantly. The behavioral objectives treatment does not seem to be detrimental to student achievement.

# The Achievement Effect of Behavioral Objectives in Introductory Psychology

by

James P. Hogan

A THESIS

submitted to

Oregon State University

in partial fulfillment of
the requirements for the
degree of

Doctor of Philosophy

Completed April 1981

Commencement June 1981

APPROVED:

Redacted for Privacy

Professor of Education
in charge of major

Redacted for Privacy

Division Coordinator of the School of Education

Redacted for Privacy

Dean of Graduate School

Date thesis is presented April 29, 1981

Typed by Donna Lee Norvell-Race for James P. Hogan

ACKNOWLEDGMENTS

Sincere thanks are due to:

Dr. Carvel Wood, my major advisor, as he opened doors both within the bureaucracy and my own mind;

Dr. Wayne Courtney, who always had a warm welcome and the time to answer my statistical questions;

Dr. Ben Murdzek, who as a historian gave at times the sagest advice;

Dr. Ed Strowbridge, who gave considerable assistance in the early stages of the dissertation;

Dr. Tom Hogg, Graduate School representative, whose door was always open and whose applied anthropological approach helped me through some difficult decisions; and

Dr. Ken Brown, an experienced researcher and writer who read each chapter and offered, with good humor, suggestions for improvement.

Special thanks are expressed to the Department of Psychology, especially to Dr. Ted Madden, Mr. Len Seyfarth, Mr. Jack Higgins and Mr. Tom Halloran. Each was instrumental in implementing the experiment.

Most importantly, sincere thanks to my sons, Adam and Seth, and my wife, Kathy, for their constant support and encouragement.

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## Chapter I

## INTRODUCTION

### Text as Curriculum

As both a novice and an experienced teacher, the researcher has found that the text for a given class is often the only curriculum made available. For example, this researcher was once employed as a vocational education teacher in rural Alaska, and was assigned to teach a shop class with neither a text nor a curriculum--merely a few hand tools and some lumber in an old, often cold classroom. What were students supposed to be able to do with these materials? What should be taught? What skills should students acquire? The materials available did not answer these questions. Even the texts for other courses in that school did not seem to match the needs of a predominantly hunting-and-gathering people who lived hundreds of miles from a road and would probably spend their whole lives in villages within a few hours' snowmobile or boat ride from the village they proudly called home. Merely covering the material in those texts, written for other students in the cultural mainstream of the 20th century, did not seem appropriate. The answer to the question of what skills these students should acquire was not only obscure; the question had not even been formulated. Tools and lumber had arrived at high tide on the July barge. A few weeks later the shop teacher emerged from a mud-spattered Cessna, sinking to his knees into the unfamiliar tundra as he made his way toward the school. Two days later a shop class was scheduled to begin.

## Behavioral Objectives

Fortunately, the idea of behavioral objectives had been suggested to the writer in a workshop conducted by a team of consultants in the early 1970's. The concept of measurable student behavior made sense. Developing a series of statements containing active verbs which stated what students were supposed to be able to do after instruction, the conditions under which they were to perform, and the level of accuracy at which they were to achieve, seemed as helpful in a "bush" environment as in the cultural mainstream. As it turned out, stating what students' performances should be after they received instruction appeared to work well. Behavioral objectives gave some indication of what students should be able to do even in a situation where teaching skills were rudimentary, training was insufficient and resources minimal. Printed behavioral objectives given to students before instruction seemed to be helpful to both teacher and students. Objectives gave order and direction. Despite the promising indications there was, however, no proof that the use of behavioral objectives helped students or increased achievement. The use of objectives was prompted by experience and acquaintance with the literature.

## Behavioral Objectives--Early Thought

In the early part of this century, Bobbitt (1918, 1924) and Washburn (1922) had suggested that curriculum goals be specific and published. Later, Tyler (1950) maintained that a statement of objectives should be a statement of the changes to take place in students. He realized that many educational programs did not have clearly defined goals. He wrote that if educational programs were to be planned and if efforts were to be made to improve them, then it was necessary to have an idea of the goals desired. Objectives, he insisted, were the criteria for selecting materials, outlining

content, developing instructional procedures and preparing tests. Taba (1962) agreed with both Bobbitt and Tyler. She wrote that behavioral objectives would help eliminate the "bugaboo of coverage" of the material (p. 201). She argued for concreteness and clarity in writing objectives so that they could serve as the basis for designing instruction and as the focus for designing student evaluations. Gagne and Briggs (1974) were also concerned with the precise specification of learner outcomes. They wrote that objectives, when used to design measures of student performance, could be used to determine whether course objectives have been met. Many others have detailed the advantages of behavioral objectives (Plowman, 1971; Popham, 1969; Block, 1971; Carroll, 1970; and Goldner, 1973). They maintained that behavioral objectives assist in assessment, and guide the teacher in selecting instructional methods. These writers also suggested that behavioral objectives have an effect upon students. Specifically, Armstrong (1970) suggested that objectives improve student learning, and give students a feeling of confidence in their ability to learn; give students feeling of control over their learning; and give direction.

## Behavioral Objectives--Disagreement

Not all curriculum writers have agreed, however, about the value of behavioral objectives. Eisner (1967) argued that objectives cannot be predicted with the accuracy claimed necessary by the advocates of instructional objectives. Atkin (1968) agreed with Eisner arguing that the learning situation has many unforeseen elements which cannot always be predetermined. Further, even though behavioral objectives may be measurable, they may not meet the educational needs of the students. As Eisner (1967) explained, some subjects, such as mathematics and science, lend themselves to more precise specification of objectives than other subjects, such as art, literature or music. Thus, behavior is a very narrow criterion by which to judge learning. Although

student behavior may be a measure, it cannot be the final criterion for judgment. Ebel (1970) agreed with Eisner that the determinants of behavior: knowledge, understanding, attitudes and values are the real goals of instruction. Classroom or test behavior is a limited educational goal. Nelson (1976) addressed some additional humanistic concerns. He thought that objectives mechanized human interaction, made the minimum expectations the only ones and sacrificed teacher and student creativity for conformity. Eisner (1967) considered a practical concern: the possible proliferation of objectives. He concluded that course objectives might become so numerous and minutely detailed that all the objectives for a course could not possibly be attained. Students might be overwhelmed by the impossibility of mastering a multiplicity of objectives. Teachers might be overcome by the impossibility of keeping records of objectives mastered by each student.

## Arguments in Favor of Behavioral Objectives

Proponents insist that behavioral objectives can enhance learning. Opponents argue that objectives may be detrimental to the learning process. The opposing arguments are theoretical insofar as they are not supported by research. Still, educational psychology suggests a number of theories about the learning process which shed some light upon the veracity of these opposing viewpoints. The ideas of motivation, reward, repetition and feedback are among those principles used in a behavioral objectives approach to learning.

Behavioral objectives have some qualities which may enhance motivation. Klausmeier (1961) has suggested that motivation is the key to purposeful learning. Objectives allow students to know in advance what is expected of them. This prespecification of objectives provides at least three of the motivational principles which Klausmeier recommended: setting realistic goals, focusing student attention upon the objectives and arranging the learning tasks in appropriate sequence.

Extrinsic motivation is also likely to be increased because of the students' being informed that they will be tested on the objectives. Stevens (1965) indicated that it does little good to tell students after their study is completed that there will be a test. However, such a statement before beginning study may well increase short-term retention.

Related to the principle of motivation is that of feedback (Marx and Bunch, 1977). The learner must receive information about the adequacy of his/her performance. Student performance of the objectives, which are constructed from the content to be presented, provides feedback to the student. Performance of the objectives allows the student to determine where there are weaknesses in understanding. Comparison of the responses to the behavioral objectives with the material presented in the text and lectures provides feedback to the student about the adequacy of performance. The objectives also provide a basis for student questions directed to the instructor, whose responses also provide feedback.

Repetition is an ancient and time-tested principle of learning. Behavioral objectives allow for repetition of material. That is, student performance of the objective is, at least, another repetition of material presented in both a text and lecture format.

Learner response or active learning is an effective learning principle (Hilgard and Bower, 1969). The student using behavioral objectives is not presented with information to memorize but with a task to perform. Behavioral objectives encourage an active response. They challenge the student to use the resources of the course as sources of information to respond actively in order to achieve the predetermined objectives of the class. Thus, rote learning is discouraged while active response, learning by doing, is encouraged.

Gagne and Briggs (1974) maintained that retention appears to increase as material is overlearned. While overlearning is difficult to assess, at least within the objectives, repetition can be insured with

regard to key definitions and principles. Retention also appears to increase when material is reviewed (Stevens, 1965). Behavioral objectives give students an additional opportunity to review. For these reasons, then, the concept of behavioral objectives appears compatible with the principles of learning.

## Empirical Studies

However, this theoretical compatibility has not been empirically verified. The empirical studies have not revealed a consistent, statistically significant benefit for the use of behavioral objectives. The many reviews of the literature (McNeil, 1969; Duchastel and Merrill, 1974; Macdonald-Ross, 1973; Hartley and Davies, 1976; and Melton, 1978) reflect the theoretical and empirical dichotomy. Because some of these studies have a significant bearing upon the question of the achievement effect of behavioral objectives given to students it is important to consider them in some detail. A number of studies have specifically considered the effect of behavioral objectives upon student achievement. Some researchers reported that student knowledge of behavioral objectives improved learning significantly (Blaney and McKie, 1969; Dalis, 1970; Doty, 1968; Engel, 1968; Ferre, 1972; Kueter, 1970; Lawrence, 1970; Nelson, 1970; Puckett, 1971; Rothkopf and Kaplan, 1972, 1974; and Webb, 1971). Other studies found no significant difference in student achievement that could be attributed to student possession of behavioral objectives (Baker, 1969; Bassett, 1973; Bishop, 1969; Boardman, 1970; Brown, 1970; Bryant, 1970; Clingman, 1973; Conlon, 1970; Hershman, 1971; Jenkins and Deno, 1971; Jordan, 1971; Kalish, 1973; Loh, 1974; Lovett, 1971; Olson, 1971; Patton, 1974; Phillips, 1971; Rowan, 1971; Smith, 1970; Stedman, 1970; Weinberg, 1970; Zeman, 1978; and Zimmerman, 1974).

The disparity in the results of these studies appears to reflect differences in methodology among them. Furthermore, in some cases the

methodology itself is questionable. For example, many of the studies were of short duration, involving a single exposure of randomly selected subjects to behavioral objectives. Few studies were classroom based. Some involved reading a single prose passage and comparing the achievement of those subjects with and without behavioral objectives. Some compared the achievement effect of specific and non-specific objectives. Not all of the reports were specific as to what "student knowledge of behavioral objectives" actually was. Examples of the behavioral objectives and the instructions for their use were not included in all the studies. Thus, treatments and measures of achievement were not consistent. What seems to be indicated is that each study be considered upon its own merits.

An additional difficulty in assessing these studies is that not every academic area has been investigated. Mathematics and science appear to be well studied with mixed results. The social sciences have received less emphasis. There have been only two studies in educational psychology involving the use of behavioral objectives (Lovett, 1971; Patton, 1974).

A search of the literature reveals no dissertations or journal articles involving behavioral objectives and introductory psychology. Yet, this course is either a requirement for many degree programs or a popular undergraduate elective. Introductory psychology is taught at almost every college and university in the country. Would student knowledge of behavioral objectives help students to be more successful in these courses? What conclusions drawn from past studies of behavioral objectives are applicable to classroom research? Are behavioral objectives sufficient in themselves to increase student achievement, or are there other factors not incorporated in these earlier studies which should be considered and incorporated into a research design in which behavioral objectives are also used? These questions remain unanswered.

## Recommendations for More Effective Use of Behavioral Objectives

Those who have reviewed the extant studies have made some recommendations for more effective implementation and use of behavioral objectives which are stated in terms of student performance. Bloom (1956) and Huenecke (1970) suggested that objectives be placed in a hierarchy, a cognitive taxonomy of intellectual skills which range from lowest to highest as follows: knowledge, comprehension, application, analysis, synthesis and evaluation. Their rationale was that this hierarchy would increase the teacher's repertoire of responses. It would also increase the student's range of responses by making the student aware of the different levels of knowledge. Referencing the post-test to the objectives was suggested in the review by Duchastel and Merrill (1973). Tiemann (1968) reiterated Stevens' (1965) thesis that students be informed that the tests would be referenced to the objectives. Scriven (1977) recommended the construction and use of a test item pool from which to select the items for the dependent variable. McNeil (1969) repeated Tyler's (1950) idea that students be given the opportunity to practice the behavior required by the objective. These recommendations, based upon their analysis of the research completed, are in agreement with the principles of learning already discussed.

## Statement of the Problem

The existing design of the Psychology 201 course, the introductory psychology course at Oregon State University, offered the opportunity to test the achievement effect of student knowledge of course behavioral objectives within an environment which allowed the implementation of these recommendations for more effective student use of behavioral objectives.

The central focus of this study was to determine if student

knowledge of course behavioral objectives resulted in increased achievement in psychology.

## Purpose

The main purpose of this study was to determine if student achievement in introductory psychology was increased when students were given behavioral objectives. Briefly, the central question was: Are behavioral objectives effective? A second concern was to develop and validate a set of behavioral objectives for each unit. A third concern was to implement the recommendations made by the research reviewers: assigning each objective to its place in a cognitive taxonomy, using a test item pool for the construction of the dependent variable, encouraging student practice of the objectives and informing students of the relationship between the objectives and the examinations. If these procedures resulted in increased achievement, then a fourth purpose of the study was to identify a means for instructors of introductory psychology to increase the achievement of their students.

## Need for the Study

Of the many studies which have examined the effect of student knowledge of behavioral objectives, none has involved students in introductory psychology, a course taken by most undergraduates either as a requirement or as a popular elective. Furthermore, few of the studies completed have been concerned with the effect of behavioral objectives upon student achievement in higher education. The studies which have been completed suffer from some methodological inadequacies which restrict their application to higher education and classroom situations.

No experiments have been conducted at OSU using introductory psychology students as subjects which specifically tested an

educational hypothesis related to achievement in that course. The specific question of whether student use of behavioral objectives has an effect upon achievement has not been studied in introductory psychology. The recommendations of research reviewers have not been applied in a classroom situation. There is, therefore, a need to apply the recommendations of past researchers to an unanswered question: Are behavioral objectives effective in increasing achievement in psychology? The introductory psychology course at Oregon State University offered the opportunity to test the achievement effect of behavioral objectives while incorporating the recommendations of past research.

## Design of the Study

Psychology 201 had three class meetings each week: two hours of videotaped televsion lectures and one hour of contact with a recitation instructor. The lectures were available for viewing on Cable Channel 5 anywhere in the community of Corvallis, Oregon, as well as in three rooms in Kidder Hall on the OSU campus. Each lecture was broadcast at five different times during the week. No attendance was taken for these lectures, which covered the same topics as the text but in a different manner. In addition to the two lectures and one recitation class, student materials included the required text by Hilgard and Atkinson (1979), Introduction to Psychology and an optional Study Guide (Atkinson and Ruch, 1979) with programmed instruction. While optional, the use of the Study Guide was encouraged by the instructors.

In the Study Guide, non-behavioral conceptual goals, generally beginning with the term, "Understand," were published for each unit. These conceptual goals were used in conjunction with the text, programmed materials in the Study Guide and videotaped lectures in order to construct behavioral objectives. The objectives were assigned to

their proper level in Bloom's (1956) cognitive taxonomy. Two judges examined the resulting objectives. Dr. E. Strowbridge of the School of Education, Oregon State University, judged the format and taxonomical placement of the objectives. Mr. L. Seyfarth, a former Psychology 201 instructor and the current course coordinator, judged the resulting objectives for their conformity to the conceptual goals of the course. In addition, non-behavioral weekly outlines and weekly study guides were prepared as placebo treatments for the control groups. The behavioral objectives, outlines and study guides were typed, duplicated, collated and stapled and delivered to the instructors prior to their recitation section meetings.

Two graduate teaching assistants (GTA's) with at least one term of experience in Psychology 201 were assigned six recitation sections each. Recitation times were drawn from a hat to determine which sections would receive each treatment. Two sections of approximately thirty students each, randomly assigned by computer to each instructor, received the behavioral objectives treatment. This treatment consisted of the instructor actually giving the students six to fourteen printed statements of what they should be able to do after completing the week's work in the course. Each objective contained an active verb, i.e., list, match, define., etc. Printed instructions included a statement that the final examination would be referenced to the objectives, that the objectives should be used as a guide for study and that they should be practiced. Space was left after each objective for the student to perform the activity specified by the objective.

Four sections for each instructor received placebo treatments. Two sections for each instructor received weekly outlines, short paragraphs of general statements of the concepts which would be introduced during the week. Two sections of each instructor received study guides, a series of statements each beginning with the word, Study. Treatments for these control sections were also determined by a blind draw. Students were assigned to recitation sections by computer.

After specifying that they wished to take Psychology 201 on their course request card, students were assigned by computer to one of the eighteen available recitation sections, only twelve sections of which received either experimental or placebo treatments. Each recitation section met eight times during the winter term, 1981. A copy of the eight sets of behavioral objectives is included in Appendix A. The Study Guides and Weekly Outlines are included in Appendix B.

In summary, four sections received the weekly behavioral objectives treatment and eight sections received control treatments. The behavioral objectives, weekly outlines and study guides were the three independent variables. The dependent variable used to compare treatment effects was the final examination. The dependent variable was constructed from a test item pool, referenced to the conceptual goals of the course. The publisher provided a 100-item pool of questions for each chapter. This pool was used by the course coordinator to select the 100 four-way choice items for the final examination. Analysis of covariance (ANCOV), using high school grade point average (GPA) as the covariant, was used as the statistical tool to determine if there were a significant difference between treatment groups. The data were programmed, entered into a computer and analyzed to determine if a significant difference existed between control and treatment groups. The findings were reported and summarized with relevant recommendations for implementation and for further study.

## Hypotheses of the Study

This study proposed three null hypotheses, which were tested at $\alpha = .05$:

1. There will be no significant achievement difference between students receiving behavioral objectives, outlines or study guides.
2. There will be no significant achievement difference between the groups taught by different instructors.
3. There will be no significant interaction effect (instructor x treatment).

## Assumptions

In conducting this study, certain basic assumptions were made:

1. The course content was cognitive.
2. The dependent variable constructed from the publishers' test item pool was an appropriate measure of achievement for the course.
3. A minimum cell size of 33 subjects accurately reflected the population of Oregon State University students who took the course.
4. The Human Subjects Board required that subjects be free to choose to be subjects. Students were not told of the exact nature of the study. They were free to participate and free to withdraw at any time.

## Definitions of Terminology

It seems proper to define and clarify the meaning of the following terms as they are used in this study. Other terms or phrases used in this study are self-explanatory.

Achievement: This was determined by ANCOV, comparing mean scores of the three groups on the final examination with GPA as the covariant.

Affective: Relating to feelings or emotions.

ANCOV: Analysis of covariance. This statistical procedure allowed for the testing of final differences by taking into account the initial differences, thus, in effect, statistically equalizing the subjects.

Behavioral Objective: A statement of what students should be able to do after instruction which contained five elements: (a) the student who is to perform; (b) the actual behavior which would demonstrate mastery of the objective; (c) the result, product or performance which would be evaluated; (d) the relevant conditions; and (e) the standard of perfection.

Cognitive: Relating to intellectual processes.

Cognitive taxonomy: An arrangement of objectives based upon the type of intellectual skill demanded of the learner based upon Bloom (1956). The levels from lowest to highest were as follows: (a) knowledge; (b) comprehension; (c) application; (d) analysis; (e) synthesis; (f) evaluation.

Control Groups: Those classes of students who received weekly outlines or study guides.

Conceptual Objectives: Non-behavioral statements of what students should be familiar with, know or understand.

Final Examination: The 100 multiple choice item dependent variable constructed by the course coordinator from thepublisher's test item pool.

GPA: High school grade point average, the covariant.

GTA: A graduate teaching assistant employed by OSU.

Instructor: A male GTA with at least one term of teaching experience in Psychology 201.

NSD: No significant statistical difference.

OSU: Oregon State University, Corvallis, Oregon.

Placebo treatments: These consisted of weekly outlines and weekly study guides distributed to subjects in the control groups.

Psychology 201: The introductory psychology course at OSU which consisted of the following units of study: (a) The Nature of Psychology; (b) Biological Basis of Behavior; (c) Psychological Development; (d) Sensory Processes; (d) Perception; (e) Conditioning and Learning; (f) Remembering and Forgetting; (g) Language and Thought.

SD: A significant statistical difference.

Test Item Pool: A 100-item file of multiple choice questions for each chapter prepared by the publisher of the text and Study Guide. Each question was referenced to a conceptual objective in the Study Guide and assigned to a cognitive level.

Weekly Study Guides: A list of non-behavioral statements which began, "Study _____."

Weekly Outlines: A short paragraph preview of general topics which was be presented during the week in the course.

Winter Term: That part of the school year at OSU which commenced on January 6, 1981 and terminated on March 21, 1981.

# Chapter II

## REVIEW OF THE LITERATURE

This review of literature will consider (a) the rationale for behavioral objectives; (b) the arguments against behavioral objectives; (c) theories of learning and behavioral objectives; (d) empirical studies of behavioral objectives; (e) recommendations for more effective use of behavioral objectives; (f) summary.

### The Rationale for Behavioral Objectives

It was Dewey's idea (Tanner, 1975) that educational movements are reflections of larger social movements within the society. For example, business was a successful model during the early part of this century. From the 1920's to the Crash of '29, the efficiency model of business was urged upon many institutions including the schools. This faith in business methods went hand in hand with faith in the power of science to solve educational problems. The old interpretations of learning--the theories of transfer and mental discipline--were crumbling under the assault of empirical research. Thorndike's (1924) study, which measured the relative disciplinary value of different high school subjects by assessing gains in intelligence, found no difference in gains for one subject or group of subjects over another. Thorndike concluded that ". . . the intellectual value of studies should be determined largely by the special information, habits, interests, attitudes and ideals which they demonstrably produce" (1924:98). In other words, no one subject or group of subjects was more likely than any other to result in a general improvement of the mind. Learning, according to the research of Thorndike, was specific rather than a matter of mental discipline, as was once believed. Transfer did not depend upon the disciplinary value of any study of the classics. Transfer only

occurred if the old and new activities shared a similar content or method of study. The conclusion drawn from the experiments of Thorndike was that the best way to prepare a student for a given goal was to proceed directly, to practice the activity itself.

Thorndike's experiments did not stand alone. His conclusions were borne out in a series of studies during the next few decades (Broyler et al., 1927; Wesman, 1945). According to the experimental evidence, learning was specific and not a matter of mental training. The researchers demonstrated the desirability of direct training in the task to be accomplished, rather than dependence upon transfer from subjects which were formerly thought to strengthen the intellect.

Education, formerly an art, was gradually changing. The experiments and writings of Pavlov, Watson and Skinner were transforming education into a science. The elements of science--observation and measurement--gradually came to be applied more and more to education. The definition of learning changed. It was no longer seen as a strengthening of the mind through practice but as an observable change in behavior as a result of experience or practice. At the technological level, this redefinition meant that the curriculum makers came to see themselves as engineers or technologists concerned with the how and not with the what. Educators were to be mechanics, not philosophers (Callahan, 1962).

While the use of behavioral objectives did not become popular until after the publication of Mager's classic, Preparing Instructional Objectives (1962), the concept was introduced at the beginning of the century. In the early part of this century as now, education was under attack for a variety of "failures." The successful industrial production model was being urged upon education as a remedy for its ills. Franklin Bobbitt was the earliest advocate of the technological approach. He urged educators to "Work up the raw material into the finished product for which it is best adapted" (Bobbitt, 1912:269).

For Bobbitt the analogy between business and education was obvious. "Education is a shaping process as much as the manufacture of steel rails" (Bobbitt, 1913:11). He wrote that the purpose of education was to prepare the individual for specific tasks. He saw the curriculum as a series of things which children must do and experience to develop the abilities to perform the tasks which make up adult life (1918). In a later book Bobbitt wrote, ". . . the first task is to discover the abilities and personal qualifications necessary for proper performance. These are the educational objectives" (1924:8). "As long as objectives are but vague gueses, or not even that, there can be no demand for anything but vague guesses as to means or procedure" (1924:41). Bobbitt might be considered the father of behavioral objectives, since he argued for avoiding general unanalyzed objectives and vague-sounding hopes and deciding instead what specific educational results were to be produced. He advocated stating these objectives in the everyday language of common sense.

Washburne (1922) also wrote in favor of establishing definite goals. He even went so far as to advocate publishing a goal book, an abbreviated course of study, to be placed in the hands of students. He thought that the establishment of goals should be followed by instruction, then testing to determine if the goals were achieved. Self-correcting practice materials were also to be provided. Washburne was concerned with student achievement. He advocated the establishment of goals as the first step in the process designed to increase achievement.

More contemporary curriculum theorists also began to think and write like engineers. Ralph Tyler (1950) in Principles of Curriculum and Instruction projected a succinct technological, rather than philosophical, approach to curriculum. Tyler saw the instructional program as a functional instrument. He explained that many educational programs did not have clearly defined goals. Yet he thought that goals

were necessary to develop and/or improve an educational program. The educational goals formed the base from which materials were to be selected, content outlined, instructional procedures developed and tests and examinations prepared. He criticized any objectives stated as things which the instructor is to do. This type of objective, he wrote, is not really a statement of instructional goals. The purpose of education is not to have the instructor do certain things but to bring about changes in students' behavior. Thus, a statement of objectives of the school should be a statement of the changes to take place in students.

For Tyler, objectives were both the basis for designing instruction and the focus for evaluations. Not until objectives have been specified and opportunities for the behavior to be expressed have been identified can evaluation instruments be considered. Unless there is some clear idea of the type of behavior implied by the objective, Tyler maintained there is no way to decide what kind of behavior to look for in students, or to determine how well the objective was attained. Thus Tyler argued for clear behavioral objectives as the foundation for designing instruction and evaluation.

Taba (1962) agreed with Tyler. She maintained that a curriculum should have objectives which describe both the behavior and the content to which the behavior applies. This two-fold specification of the subject matter and cognitive or intellectual skills, she wrote, will go a long way toward eliminating the "bugaboo of coverage" (p. 201). She maintained that educational objectives often lack clarity. To overcome this, objectives need to be stated specifically enough so that there is no doubt as to the behavior expected, or to what subject matter the behavior applies. Nonetheless, although behavior is the goal, she argued that it is dangerous to write specific objectives, such as the ability to write in paragraphs, as if they

can be mastered once and forever (p. 203).

In more recent years, a number of writers have argued for the utility of behavioral objectives (Plowman, 1971; Popham, 1969; Carroll, 1970; and Beauchamp, 1975). Gagne and Briggs (1974) have summed up the arguments, all of which maintain that the objectives of instruction need to be stated in definite terms and to be concerned with what the learner will be like after instruction. Like Tyler and Taba, these writers saw objectives as the basis for developing instruction, designing measures of student performance, and determining whether course objectives have been achieved.

Behavioral objectives also have advantages in terms of planning and evaluation (Plowman, 1971; Popham, 1969; Block, 1971; Carroll, 1970). Armstrong et al. (1970) listed the advantages of behavioral objectives: (1) They define the prerequisites to learning more accurately and thus aid curriculum design; (2) they help in the assessment of student progress; (3) they help the teacher plan what to teach and when to teach it; (4) they also help the students by giving them direction. When there are no objectives or if the objectives are unclear, students do not know what is expected of them.

The arguments of the proponents of behavioral objectives are reasonable. It is difficult to argue with the clear specification of educational objectives. Clarity and specificity appear to have advantages for the learner, the teacher, the curriculum evaluator and for the educational administrator. Yet not all writers view behavioral objectives favorably.

## Arguments Against Behavioral Objectives

The technological approach to education which began early in the century lost ground during the Depression and the following world war. It seemed to be resurrected in the 1960's, sparked perhaps by Sputnik

and the publication of Mager's Preparing Instructional Objectives in 1962. Programmed instruction and computer-assisted learning were touted as the wave of the future, a wave which has failed to crest despite the powerful arguments for the use of behavioral objectives. Schools have been and continue to be places of book learning. Few teachers specify in advance what they wish students to be able to do after instruction (Nervobig, 1956; Ammons, 1964). Thus, fewer students are aware of what they are supposed to be able to do after a learning sequence. There are a number of philosophical reasons for this situation. Eisner (1967) reviewed all pro-behavioral objectives literature and drew a number of conclusions. First, educational objectives cannot be predicted with the accuracy claimed to be necessary by the advocates of behavioral objectives. Second, some subjects lend themselves to more precise specification of objectives than others. Third, objectives can be used only as a criterion of student performance, not as a final judgment. Fourth, objectives might become so numerous and detailed that all the objectives for a course could not possibly be attained.

Atkin (1968) presented similar arguments. He argued that the learning situation has unforeseen elements which cannot be determined prior to teaching. Inflexible objectives may not meet the constantly changing needs of the classroom learning situation. Although predetermined objectives may be measurable, they may not meet student needs.

Ebel (1970) agreed with the advocates of behavioral objectives that the purpose of education is to change behavior. But he maintained that the real goals of education are the knowledge, understanding, attitudes and values which elicit behavior. The behaviors are goal-indicators, not the goals in themselves.

Nelson (1976), while supporting the concept of skill mastery, pointed out some additional problems in using behavioral objectives. He maintained that they mechanize human interaction, make the

predetermined goals the only ones, sacrifice creativity for conformity and stress adjustment rather than expansion.

At present, the conflict between opponents and proponents of behavioral objectives is unresolved. Opponents of behavioral objectives argue that trivial behaviors are the easiest to state in behavioral terms and that behavioral objectives will therefore reduce educators to teaching the trivial. Proponents reply that specification of the trivial objectives will result in their elimination; the trivial will disappear and be replaced by worthwhile objectives.

Prespecification, opponents insist, is undemocratic and does not allow for spontaneity. Advocates of objectives are in agreement with this, but they argue that education is essentially undemocratic. Educators know how they want students to perform, and seek to achieve these predetermined behaviors.

Speaking to the issue of spontaneity, those in favor of objectives argue that educators should be able to justify spontaneous instructional opportunities in terms of worthwhile ends and not solely for themselves. Indeed, objectives make the instructor's criteria explicit. Yet the opponents of behavioral objectives counter that it may be difficult to identify measurable pupil behaviors in certain subjects. Not so, argue proponents. There are criteria even in the arts and these implicit criteria need to be made explicit.

Those in favor of objectives maintain that objectives allow accumulation of evidence of student achievement and teacher competence. Opponents argue that this poses a threat to teachers who fear being judged on the basis of their ability to produce changes in learners. Proponents respond that teachers should be held accountable and be evaluated in terms of their students' achievements.

Opponents assert that unanticipated results are often the most important outcomes of a learning sequence, and that prespecification of goals may make the educator inattentive to these unanticipated results.

Proponents argue that if these unforeseen results are manifested, they should be built into the objectives when they are discovered.

In summary, then, it seems that the arguments of the opponents of behavioral objectives tug at the humanistic side of educators: spontaneity, freedom, and creativity. The proponents' arguments come down firmly on the scientific side: measurability, specificity, and accountability. While this humanistic-scientific duality persists both in the literature and in the classroom approaches of educators, the writings and research of learning psychologists offer some insights which should be considered in any attempt to resolve this thorny issue.

## Behavioral Objectives and Learning Theory

In his book The Process of Education, Bruner (1960) developed four themes which, while not theories per se, are important principles of learning. Two of these--the need for giving students an understanding of the structure of the subject and the need for stimulating motivation--are compatible with the behavioral objectives approach. Prespecification of what students should be able to do after the instruction should provide some structure into which the student can organize information. There is also some evidence to indicate that the use of behavioral objectives may be motivational.

Moreover, Bruner's themes and approach are not entirely new. Thirty years before his study, Monroe and Engelhart (1930) reviewed the experimental and observational studies of motivation. In their conclusion, they suggested six motivational methods which they thought were worth more frequent use in the learning situation. Three of their six recommendations were components of the behavioral objectives method. For example, Monroe and Engelhart recommended establishing positive mind sets or attitudes. Knowing in advance what is expected does not guarantee a positive student mind set, yet it is probably not detrimental to it. Their second recommendation was that the

student be acquainted with definite objectives. This is the key element in the behavioral objectives approach. With behavioral objectives, students know in advance exactly what it is that they are expected to be able to do after instruction. Feedback, or informing the student of success in learning, is a third motivational device which Monroe and Engelhart recommended. Behavioral objectives, if they are used in conjunction with the other resources of the course, provide a method for self-feedback. When in doubt about the adequacy of performance, students can question the instructor about their mastery of a specific objective.

More recently, Gagne and Briggs (1974) while aware that in most cases learning is supported by the stimulation provided by the instructor, have indicated that mature learners learn on their own. Behavioral objectives give direction to self-learning. As students gain experience in learning and arrive at the post-high school level, much of their learning is probably self-learning, the most common form of which is individual study. There is, moreover, a history of research which suggests some conclusions about learning and study. Morgan and Deese (1957) concluded that when students have no special instruction in how to study, they seldom retain more than half of what they read. Even a second reading adds only slightly to the amount retained. Entwisle (1960), in her review of research on study, concluded that most students improve after systematic instruction on a method of study. Stevens (1965) offered a few rules which he derived from his study of the learning process. Of the eight rules, six are part of the behavioral objectives approach to learning:

(1) Adopt an active role. According to Stevens (1965), study should be an active search for information. Specifying the objectives in advance indicates to the student what information should be sought. Behavioral objectives encourage the adoption of an active role by the learner in seeking out information and responding to the objectives.

(2) Set specific and immediate goals. When behavioral objectives are used, the specific immediate goals have already been established for the student. At that point it is up to the student to make the commitment to achieve the goals.

(3) Survey or get an early grasp of the general structure. While behavioral objectives do not insure a survey-like grasp of the overall structure, they do represent a logical breakdown of the material into understandable units.

(4) Devise questions to be answered. In behavioral objectives the questions have already been formulated.

(5) Answer the questions. Behavioral objectives are similar to questions, insofar as they require a response.

(6) Review. The behavioral objectives format provides an opportunity for the learner to review responses.

Kapfer asked the question, "Who needs behavioral objectives?" (1970:14). His answer was that students need them. The research on self-study and the rules Stevens (1965) derived from the research seem to indicate that behavioral objectives should be a powerful learning tool for students.

Looking at the more theoretical approaches to learning, it is found that if the many approaches to learning are synthesized, there remain essentially four theories of learning. A number of principles, perhaps oversimplified, can be derived from these.

The S-R theory of learning emphasizes active learning. The response is important. Learning by doing is encouraged by S-R theorists. Repetition is also important. Practice of the behavior will strengthen the skill resulting in overlearning and increased retention. Reinforcement is also important to strengthen the bond between stimulus and response. Behavioral objectives specify the behavior and

encourage learner response. Performance of the objectives is learning by doing.

Gestalt theory stresses the interrelatedness of the material. The theory emphasizes that the essential features of the material to be learned must be open to the learner's inspection. Behavioral objectives are given to students before instruction and they reveal the essential desired learning outcomes. The Gestalt cognitive theory argues that learning through understanding is more permanent than rote or formula learning. While it would be possible to memorize the responses elicited by the objectives, the objectives require actively formulating intelligible responses rather than merely repeating a formula.

Personality and Social Psychology suggest a number of principles from their disciplines. The abilities of the learner are important. These theories stress that students learn at different rates. In addition, these approaches to psychology maintain that self-esteem and its related manifestations, including self-confidence, must be taken into consideration. Behavioral objectives, when used in a classroom setting, permit some variability in learning speed. It has also been asserted by Goldner (1973) that self-confidence is one of the psychological by-products of the behavioral objectives approach.

In summary, the major theories of learning offer some principles which appear to be in harmony with the student or learner use of behavioral objectives. The concepts of active learning, practice, learning through understanding, and learning at variable rates are integral components of the behavioral objectives approach. In addition, Stevens' (1965) research in the area of individual study and his resulting rules--being an active learner, setting goals, grasping over-all structure, devising and answering questions and reviewing these answers--are the basic principles of the behavioral objectives approach. Theoretically, if students know what the

behavioral objectives are for a course, they should perform well in that course.

## Empirical Studies of the Effect of Behavioral Objectives

The conclusions above have not been borne out by empirical studies. In fact, if numbers could sway theorists and philosophers, then the non-behavioral viewpoint has the majority. Of the 52 studies reviewed by Zeman (1978), less than one-half reported a significant difference in favor of the use of behavioral objectives.

Many hypotheses have been investigated to account for this apparent discrepancy between theory and practice. McNeil (1969), Barth (1974), Duchastel and Merrill (1973), Macdonald-Ross (1973), Walbesser and Eisenberg (1972), Hartley and Davies (1976) and Melton (1978) have reviewed the experimental studies and drawn, at times, conflicting conclusions as to their implications. A number of independent variables have been manipulated: specificity of the objective, behavioral vs. non-behavioral objectives, type of learning (knowledge or comprehension), and differential learner characteristics. Dependent variables have usually been measures of learning or retention and occasionally attitudinal measures.

One category of studies, for example, considered the effect of specific vs. general objectives on student achievement. Two of these studies (Dalis, 1970 and Janeczko, 1971) concluded that students who received specific objectives and conditions for satisfactory performance achieved significantly higher scores on objective tests than students who received more general objectives. These findings did not hold in five other empirical studies (Oswald and Fletcher, 1970; Weinberg, 1970; Jenkins and Deno, 1971; and Lovett, 1971). In these studies, there was no significant difference in achievement which

could be attributed to specificity of the objective.

A second category of studies investigated the relationship between teacher knowledge and use of behavioral objectives and student learning. Five studies (Baker, 1967; Cardarelli, 1971; Crooks, 1971; Clingman, 1973; and Kalish, 1973) found no significant difference between those students whose teachers had and those who did not have behavioral objectives. Yet, another five studies (Wittrock, 1963; McNeil, 1967; Piatt, 1969; Glowatski, 1973; Payne, 1972) reported a significant difference in student achievement for those students whose teachers had and used behavioral objectives.

A third category of studies considered the effect of behavioral objectives on learning time. Out of seven studies, two by Mager and McCann (1961) and Allen and McDonald (1963) reported that the use of objectives reduced learning time significantly. In the other five studies there was no significant difference in learning time between students who had the objectives and those who did not (Smith, 1970; Janeczko, 1972; Merrill and Towle, 1971; Rowan, 1971; and Loh, 1972).

Melton (1978) has provided the most recent review. The studies considered examined the effect of behavioral objectives on learning from written materials. The same inconsistency of results was reported. The experiments of Blaney and McKie (1969), Conlon (1970), Doty (1968), Engel (1968), Kueter (1970), and Lawrence (1970), reported a significant difference in favor of the use of behavioral objectives with written prose material from different disciplines. The results did not hold in the studies of Bishop (1969), Brown (1970), Cook (1969), Etter (1969), DeRose (1970), Smith (1967), and Stedman (1970).

There are several aspects of these studies which might help to explain the inconsistency of their results. No study is an exact replication of another. Some studies employed objectives that were more

precise than others. Others failed to define what sort of objectives were employed. Still others differentiated between and compared different types of objectives or objectives with graduated levels of specificity. As a result, it is difficult to draw generalizations which would apply beyond the often narrow, controlled experimental situation. In fact, it is not even always clear what is meant by behavioral objectives in the studies.

Examples of the behavioral objectives used are not always provided in the reports, nor are the uses of the objectives standardized across the studies examined. Moreover, few of the studies provided the students with any instruction as to how the objectives were to be used. Since most students are unfamiliar with behavioral objectives, some instruction in their use may be an important factor in determining the effect of objectives upon learning. And finally, many of the studies were of a short duration. They were often conducted as minicourses within a course. In other studies there was a one-time exposure to behavioral objectives, followed by a prose passage to be read, and a test. Most of the studies were conducted under tightly controlled non-classroom research situations. Few took place over a full term.

In summary, though less than one-half of the studies supported the use of behavioral objectives as an instructional method for improving student achievement or reducing the time to learn, the studies completed have not resolved the issue. Whether behavioral objectives are beneficial in increasing achievement is a much-investigated question, but no definitive answer has been provided. Tallying the numbers of significant and non-significant studies yields little of value because the studies, while assessing the same effect, do so in a variety of experimental settings, each with its own particular variables. The following table of experimental studies involving the use of behavioral objectives in higher

TABLE 1: Experimental Studies of Behavioral Objectives in Higher Education

| Author | Date | Subject | Independent Variables | Dependent Variables | Conclusion |
|---|---|---|---|---|---|
| Boardman, D. | 1970 | Remedial Chemistry | 1) Behavioral Objectives<br>2) Attendance<br>3) Placebo treatments | Behavioral Objectives Related examinations | NSD in achievement |
| Booth, J. | 1973 | Speech-Communication | 1) Nine Behavioral Objectives at 3 levels of learning<br>2) Nine non-Behavioral Objectives | 1) Researcher designed 50-item test<br>2) Purdue Rating Scale for Instruction | SD in achievement and attitude |
| Coleman, C. | 1972 | Physical Science | Performance Objectives<br>Placebo Treatment | 1) Two standardized tests<br>2) One teacher-made achievement test | NSD |
| Cook, J. | 1969 | Mathematics for elementary education majors | Self-instructional text materials and varying levels of information regarding learning hierarchies | Post-test | NSD |
| Hershman, K. | 1971 | Introductory Physics | 1) Advance organizers<br>2) Behavioral Objectives<br>3) Personality sketch | Post-test | NSD |
| Jordan, J. | 1971 | College Biology | 1) Behavioral Objectives<br>2) Non-Behavioral Objectives | Sequential test of educational progress | NSD |
| Lovett, H. | 1971 | Tests and Measurements | 1) Two levels of feedback<br>2) Four levels of knowledge of 28 Behavioral Objectives | 4 tests, one after each class session | Increased knowledge of objectives decreased achievement |
| Micek, S. | 1974 | Introductory Biology | 1) Training vs. no-training in using objectives<br>2) Participation in selecting objectives vs. no participation | 1) Number of objectives mastered<br>2) Time required for mastery | SD in number objectives<br>NSD in time |
| Morse, J. | 1972 | Human Development | Different levels of training in the use of objectives | 40-item criterion test | NSD in achievement |

TABLE 1, continued

| Author | Date | Subject | Independent Variables | Dependent Variables | Conclusion |
|---|---|---|---|---|---|
| Okoduwa, B. | 1975 | Education of exceptional children | 1) Performance objectives<br>2) No performance objectives | Pre- and post-test | NSD |
| Patton, T. | 1972 | Learning and Measurement | 1) Behavioral Objectives<br>2) No Behavioral Objectives | 1) Teacher-made criterion test<br>2) Teacher-made attitude and information survey | NSD in achievement<br>SD in attitude |
| Phillips, J. | 1971 | Economics | 1) Behavioral Objectives<br>2) No Behavioral Objectives | Test of Economic Understanding--Form B | NSD |
| Semb, G. | 1972 | Child Development | 1) Highly specified objectives in one semester<br>vs.<br>2) No objectives in a previous semester | Short quizzes and a one-hour exam | Increase in exam performance in favor of highly specific objectives |
| Tiemann, P. | 1967 | Economics | 1) Specific objectives<br>2) General objectives | Post-test | NSD |
| Treble, G. | 1974 | Human Anatomy Lab | 1) Behavioral Objectives<br>2) No Behavioral Objectives | 1) Mid-term<br>2) Mid-term repeated after two weeks<br>3) Mid-term repeated after four weeks | 1) NSD<br>2) NSD<br>3) NSD |
| Zeman, A. | 1978 | Economics | 1) Behavioral Objectives<br>2) Lecture-Discussion | Teacher-made multiple choice examination | NSD |

educational classroom settings illustrates this confusion of realms (Table 1).

The experimental studies which have examined the effect of behavioral objectives in higher education have not demonstrated a consistently significant advantage in favor of their use by students. In almost all cases, there was no significant difference in achievement between those students who used behavioral objectives and those who did not.

Clearly, some significant features of these past studies have a bearing upon this study. There are a number of methodological inadequacies which must be considered. First, the question of the adequacy of the sample size must be considered. Some abstracts (Boardman, 1970; Hershman, 1971; Jordan, 1971; Lovett, 1971; and Tiemann, 1967) were not specific as to the number of subjects involved in the study. In other studies the cell sizes appear to be inadequate. Cook's (1969) sample was only 22 per cell. Micek (1974) divided his sample into only eight subjects in each cell. Lovett (1971) reported extremely high attrition with no indication of the number of original subjects. Cell sizes as small as those in Cook's (1969) and Micek's (1974) studies are inadequate according to the minimum cell sizes recommended by Cohen (1969). The significance of studies with such small cell sizes is therefore so questionable that inferences cannot be drawn from these studies with confidence.

The duration of an experiment is a second factor which may have a bearing on the outcomes of the experiment. While in some cases a full term or semester was used for the treatment, in others the duration was a matter of days or only a part of the course (Cook, 1969; Lovett, 1971; Okoduwa, 1975; Patton, 1972).

A third factor which must be considered is the dependent variables used to assess treatment effects. In some studies, the dependent variable was not specified. In other experiments, a standardized test was used (Coleman, 1972; Jordan, 1971; Phillips, 1971). While these standardized tests have known validity and reliability, there

is some doubt as to whether they assessed what had been taught and whether, in fact, they assessed achievement of the particular course objectives. None of the abstracts provided data on the validity or reliability of the assessment device, whether experimenter/teacher-made or standardized. Such data are important in making a determination as to the conclusions drawn.

The experiments conducted in classroom situations in higher education suffer from many of the same methodological flaws of studies conducted in more rigidly controlled situations. Sample size is a problem. Treatments are not always specifically defined. The instructions given to students are not always clear. The duration of the experiment is not always a full term or semester. There is no reporting of validity of reliability data for the dependent variable and no assurance that the assessment device measures the content of the course objectives. Finally, the studies have not incorporated into their design the recommendations made in the reviews of past research of behavioral objectives.

Finally, given all the inadequacies in these studies, their cumulative results should be regarded provisionally, if not skeptically. Only one study reported a significant difference in favor of the use of behavioral objectives (Booth, 1973). The remainder, while not recording a significant advantage in favor of the use of behavioral objectives, did not report a disadvantage. Two studies (Semb, 1972; and Phillips, 1971) reported a difference which was not statistically significant. Only one study (Lovett, 1971) reported that increasing knowledge of objectives decreased achievement. In this study there were 28 objectives, four class sessions and an extremely high attrition, perhaps indicating that factors other than the treatment caused the negative achievement effect.

Despite these flawed and tentative findings, Melton (1978) has suggested that behavioral objectives should be regarded as one of several methods available to educators ". . . with research directed toward determining not only advantages and limitations but also the

conditions under which they can be used most effectively" (p. 299). Some of the conditions which have been suggested as potentially synergistic when used with behavioral objectives are set forth in the following section.

## Recommendations for More Effective Implementation of Behavioral Objectives

McNeil (1969), in his review of the research on the use of behavioral objectives, stressed both the selection of learning activities designed to achieve the objectives and the need for student practice of the objectives. Tyler (1950), too, thought that students should have an opportunity to perform the objectives. This opportunity should be built into a study designed to determine the effect of student awareness of course behavioral objectives upon subsequent achievement. Merely informing students of what the objectives are without providing an opportunity for them to practice the behavior and to receive feedback as to the adequacy of performance has not been shown to be effective in past experiments.

Placing the objectives within a cognitive taxonomy has also been suggested as a means for more effective implementation of behavioral objectives. Bloom (1956) suggested that objectives can gain meaning in the learning situation by two practices: expressing objectives in behavioral terms and placing objectives within a cognitive taxonomy. Huenecke (1970), searching for a way to move curriculum from the written document into the learning situation, agreed with Bloom (1956) and his associates that the placement of objectives in a taxonomy might be helpful because it could increase a teacher's repertoire of behaviors. She maintained that although the higher levels of knowledge are not necessarily more desirable than the lower levels *per se*, past research has suggested that teachers tend to teach too often at the lower levels. Her study suggested that teacher knowledge of the cognitive taxonomy was associated with teaching toward the higher levels. Placement of the objectives within a cognitive taxonomy made teachers more aware of the levels of knowledge. Assignment of

behavioral objectives to their appropriate level in Bloom's cognitive taxonomy may also be a factor in making students aware that mere memorization or recall at the knowledge level is not always what is required. In fact, taxonomical placement may well increase the learner's repertoire of responses. This is an important factor, as the objectives for the Psychology 201 course in the present study are at different cognitive levels.

Duchastel and Merrill (1973) reviewed the studies in which objectives were given to students. No conclusion as to the effectiveness of merely revealing objectives could be drawn. However, they did conclude that, ". . . objectives will certainly make no difference if the student pays no attention to them in the learning situation" (p. 65). Melton (1978) reviewed some possible causes of the conflicting experimental results of studies in which students were given behavioral objectives. He concluded that mere possession of objectives may be insufficient. Students may ignore them, either because they are unaware of how to use them, or because prior experience has shown them to be unimportant. He also maintained that if the objectives are general, vague or ambiguous, they will be ineffective. This idea was first suggested by Bobbitt (1924), who recommended that objectives be stated in the everyday language of common sense and that they be clear and specific. Behavioral objectives must be written so that they are easily readable and that the behavior required is specific and neither extremely difficult nor extremely easy.

Tiemann (1968) in his conclusion also stressed the necessity of assuring that students understand the association between the objectives and the tests. The necessity for establishing this connection was identified earlier by Tyler (1950). For Tyler the objectives were not only the basis for designing instruction but the focus for evaluations. Scriven (1977) specifically addressed the issue of congruity of objectives and examinations. He proposed an alternative to norm referenced testing, which he thought might be an insensitive measure of the outcomes of a specific learning sequence. While he

agreed that translating course goals into testable terms was difficult, he maintained that there must be a relationship between the goals of a course, its content and the examinations. He advocated the construction of a test item pool referenced to the objectives, which would be validated by external judgment as to the cohesiveness of the goals, content and test pool items. Once in place, the item pool becomes a source of questions from which examinations can be constructed.

In summary, the recommendations for more effective use of behavioral objectives are not novel; at least some of them have been in the educational literature and suggested by past writers. McNeil's (1969) idea is a restatement of Tyler's (1950) suggestion that student practice is important. Melton's (1978) suggestions were first made by Bobbitt (1924).

The recommendations for more effective implementation of behavioral objectives call for the learners to have the objectives, for the objectives to be placed in a cognitive taxonomy, for attention to be drawn toward the objectives by a statement that the test will be referenced to them, and for encouarging practice of the objectives. In addition, some external factors include congruity of objectives with lessons and examinations, and the development of a test item pool. The objectives themselves should meet the criteria identified by Melton (1978): clearly written, readable, specific as to the behavior required, and of moderate difficulty.

## Summary

This review of literature has briefly traced the history of the behavioral objectives movement in curriculum development beginning with Bobbitt (1913, 1918, 1924), and traced its development through the writings of Washburne (1922), Tyler (1950) and Taba (1962). The theoretical arguments of the proponents of this technological approach to curriculum development have been presented (Popham, 1968; Beauchamp, 1965; Gagne and Briggs, 1974), as have the arguments against behavioral

objectives (Ebel, 1970; Atkin, 1968; and Nelson, 1976).

The relationship of the theories of learning and the behavioral objectives approach to learning has been considered. Behavioral objectives and some aspects of learning theory appear to be compatible. However, a review of the studies involving the use of behavioral objectives does not show a significant advantage in the use of objectives either in classroom or non-classroom research situations. In considering the methodology of these studies, however, we have found a number of evident shortcomings. Problems of sample size, duration, methods of operationalization and assessment devices have been examined and an effort has been made to improve upon past methodology in this study. Finally, some recommendations (Tyler, 1950; McNeil, 1969; Huenecke, 1970; Bloom, 1956; Melton, 1978; and Scriven, 1977) for more effective implementation of behavioral objectives have been introduced.

There are a number of questions which the literature and research leave unanswered:

1. Can behavioral objectives be developed which reflect the content of the Psychology 201 course at OSU?
2. Are the recommended procedures for more effective implementation of behavioral objectives effective in increasing achievement?
3. Is student achievement an appropriate dependent variable?
4. Is the final examination constructed from the publisher's test item pool a valid and reliable instrument for assessing achievement?

These questions lead to the hypothesis of this study. The design of the study attempts to include consideration of the principles of learning, the recommendations for more effective implementation of behavioral objectives, and the recommendations for constructing

usable objectives in considering an uninvestigated question: What is the achievement effect of student knowledge of behavioral objectives in introductory psychology? The hypothesis of this study then is:

$H_o$: There is no significant achievement difference in introductory psychology between students receiving behavioral objectives and students receiving placebo treatments.

# Chapter III

## RESEARCH DESIGN

No previous studies have examined the achievement effect of giving introductory psychology students behavioral objectives. The purpose of this study is to determine the achievement effect of giving introductory psychology students weekly statements of behaviorally stated objectives and instructions concerning their use. The methodological inadequacies of past studies and the recommendations for more effective use of behavioral objectives have been considered in designing this study. Behavioral objectives have been designed from course materials to correspond with the recommendations of Melton (1978). These have been submitted to a jury for approval of their format, taxonomical placement and conformity to course goals. The resulting objectives were distributed to randomly assigned subjects, who were also provided with instructions regarding their use. Placebo treatments were provided to other subjects in the introductory psychology course. The recommendations regarding instructions to be given to students were followed as well as the recommendations regarding the construction of the dependent variable. Individual item analysis and reliability data for the dependent variable have been included in the final data analysis. This chapter includes the following sections: population and sample, research design, control of variables, the covariant, experimental and control treatments, dependent variable, statistical tool and ANCOV table, the mathematical model, hypotheses, data collection and treatment.

### Population and Sample

The OSU Introductory Psychology course was taught as a two-term, sequential course with six hours of credit offered for the sequence

of Psychology 201-202. Approximately 2000 students register for Psychology 201 each year. During winter term, 1981, 454 students enrolled for Psychology 201. These students registered for the course but not for a recitation section. A computerized randomization procedure was used to assign each student to one of the eighteen recitation sections available during the term. Each of three GTA's taught six recitation sections. The sample consisted of those students assigned to the twelve recitation sections taught by two returning GTA's who had been identified in early December, 1980. These instructors agreed to distribute the experimental and placebo materials to the subjects assigned to their sections. Placebo treatments were used for control groups to nullify the Hawthorne effect. Each subject was informed that an experimental treatment was being used. A blind draw was utilized to assign treatments to sections. Section times for each instructor were written on pieces of paper and placed in a hat. The first and fourth times drawn for each instructor were designated to receive behavioral objectives. The second and fifth times drawn were assigned to receive study guides and the third and sixth times were designated to receive the weekly outlines treatment.

Sample size was determined by the criteria recommended by Cohen (1969). He recommends four factors which should be considered in determining an adequate sample size: the significance criterion ($\alpha$), degrees of freedom (df), effect size (f), and power level. The significance criterion is the familiar criterion for rejecting the null hypothesis. The $\alpha$ for this study (.05) meant that the probability of a Type I error, rejecting the null when it should have been retained was .05. Degrees of freedom (df) for ANOVA or ANCOV is determined by $(k-1)(r-1)$ for a two-way analysis, where k = columns and r = rows. In this study there were three treatments (k=3) and two instructors (r=2). Thus, df = $(3-1)(2-1) = 2$. Effect size

is concerned with the scale type of the dependent variable. A low f (.10) is used with a small scale, such as a Likert five-point scale. A middle effect size of .25 is used for a medium-size scale of 50 points. An effect size of .40 is used for a large-scale dependent variable. In this study, a 100-item dependent variable was used. Thus, an effect size of .40 was appropriate. Power level is the fourth factor to be considered. This is the probability of rejecting the null at a given significance criterion ($\alpha$). While generally set at .80, it is in fact equal to the compliment of the probability of a Type II error; that is, power = $1-\beta$. In this study, therefore, power level = .95, meaning that real differences will be detected 95 percent of the time and that Type I errors, rejecting the null when it should be retained, will occur by chance only five percent of the time. Given these four factors, Cohen (1969) has provided tables which are used to determine adequate sample size. For a df = 2, $\alpha$ = .05, f = .40 and power level = .95 the minimum recommended cell size = 33. The following obtained cell sizes were more than adequate. The cell sizes and sampling matrix were as follows:

| | T1 | T2 | T3 |
|---|---|---|---|
| I1 | 40 | 48 | 47 |
| I2 | 38 | 49 | 37 |

where T1 = experimental treatment
T2, T3 = placebo treatments
I1, I2 = instructors

Thus, the sample consisted of 259 students assigned by computer to one of twelve recitation sections of Psycholgy 201. These twelve sections were taught by two instructors, each with at least one term of experience as an instructor in the course. Four sections received

weekly statements of behaviorally stated objectives and instructions for their use. Four sections received weekly outlines. Four sections received study guides. This arrangement is detailed in the following section.

## Research Design

The design used in this study was a modification of Stanley and Campbell's (1966) Design 4 with placebo treatments for two control groups. Stanley and Campbell (1966) recommend their Design 4, since it controls for the eight possible threats to internal validity. The design is as follows:

| | T1 | T2 | T3 |
|---|---|---|---|
| I1 | $RO_1X_1O_2$ | $RO_1X_2O_2$ | $RO_1X_3O_2$ |
| I2 | $RO_1X_1O_2$ | $RO_1X_2O_2$ | $RO_1X_3O_2$ |

where
- T1 = experimental treatment
- T2, T3 = placebo treatments
- R = randomization by computer
- $O_1$ = high school grade point average
- $O_2$ = the final examination
- $X_1$ = behavioral objectives
- $X_2$ = study guides
- $X_3$ = weekly outlines
- I1, I2 = instructors

## Control of Variables

Within every classroom, there are hundreds of planned and

unplanned interactions which may influence learning. Despite this, Campbell and Stanley (1966) ". . . are gradually coming to the view that experimentation within schools must be conducted by the regular staff of the schools concerned wherever possible, especially when the findings are to be generalized to other classroom situations" (p. 21). This study controlled for student variables by computerized random assignment of students to predetermined treatment groups. Campbell and Stanley (1966) state that while randomization is ". . . a less than perfect way of assuring initial equivalence, it is nevertheless the only way of doing so, the essential way" (p. 15). Thus, there was no attempt to match or to control for differences of age, sex, school, prior knowledge of psychology or other student variables. Randomization remains an adequate assurance of group equivalence.

## The Covariant

In addition to randomization, the use of analysis of covariance (ANCOV) has been suggested by Courtney and Sedgwick (1972) as a statistical tool to handle research situations in which the researcher cannot control all the variables. All subjects in this study were assigned to either experimental or control groups and were treated as separate groups once assigned. ANCOV tests for final differences by taking into account the initial differences, in effect statistically equalizing the subjects. ANCOV statistically matches subjects based upon a premeasure, which must have a high correlation with the post measure. A Pearson r for a one-section sample of Psychology 201 from winter term, 1980, resulted in an r = .67 between high school grade point average and final examination scores. High school GPA served as the covariant. Using ANCOV with GPA as the covariant results in the dependent measure being statistically treated as though all GPA's were the same.

## Experimental and Control Treatments

The recitation instructors provided each subject in the experimental groups (T1) with a sheet of the taxonomically assigned behavioral objectives to be presented in the course during the week. The instructions for the use of these objectives were printed on the sheets. Students received instructions to use the objectives as a guide for their activities for the week. The instructions included a statement that the final examination would be referenced to these objectives. Students were also instructed to practice the objectives. Space was provided on the distributed sheets for student practice. These procedures have been recommended by prior researchers and research reviewers.

Each recitation section met eight times during the winter term, 1981. There were eight sets of behavioral objectives, each set referenced to the material to be covered during that part of the course. A copy of the eight sets of behavioral objectives is included in Appendix A.

Subjects in the control groups (T2,T3) did not receive behavioral objectives. Control group recitation class meetings were conducted without reference to behavioral objectives. Students in one control group (T2) received weekly study guides. Students in the second control group (T3) received short paragraphs outlining the material to be covered during the week. A copy of the eight sets of study guides and the short paragraphs of information, which were called weekly outlines, is included in Appendix B.

## Dependent Variable

The dependent variable was the raw score from the 100-item multiple-choice final examination. The test items were chosen by the course coordinator from the text publisher's test item pool. There were 100 items in the pool for each chapter in the text. Since

eight chapters were covered during the course, the test item pool consisted of 800 four-way choice items. The test items were referenced to the course goals which were stated in conceptual, not behavioral, terms in the Study Guide. The examination tested knowledge of the subject matter of the Psychology 201 course, not the ability to use behavioral objectives. A copy of the winter term 1981 final examination, which was used as the dependent variable for this study, is included in Appendix C. The dependent variable was used in ANCOV with high school GPA as the covariant.

## Statistical Tool and Analysis of Covariance (ANCOV) Table

A two-way fixed ANCOV determined if there were significant differences in the three groups' achievements. It also determined if there were a significant instructor effect, and tested for interaction between instructor and treatment effects. The two-way ANCOV table is as follows:

TABLE 2. Analysis of Covariance Table

| Source of variation | Adjusted df | Adjusted SS | Adjusted MS | Adjusted F |
|---|---|---|---|---|
| Treatment | 2 | A | A/2 | $MS_A/MS_D$ |
| Instructor | 1 | B | B/1 | $MS_B/MS_D$ |
| Interaction | 2 | C | C/2 | $MS_C/MS_D$ |
| Error | 252 | D | D/252 | |
| Total | 258 | | | |

## Mathematical Model

Netter and Wasserman (1974) suggest the following mathematical model for ANCOV:

$$Y_{ijk} = \mu + \alpha_i + B_i + (\alpha B)_{ij} + \delta(X_{ijk} - \bar{X}) + \Sigma_{ijk}$$

where

$Y_{ijk}$ = the dependent, the final examination scores

$\mu$ = a constant, the true mean of the independent variable

$\alpha_i$ = the main effect of the treatment

$B_j$ = the main effect of the instructors

$(\alpha B)_{ij}$ = the interaction effect of treatment and instructor

$\Sigma_{ijk}$ = the error terms, NID, $(0,\sigma^2)$

$\delta(X_{ijk}-\bar{X})$ = the adjustment of the post-test by the GPA

## Hypotheses

For this study, analysis of covariance tested the following null hypotheses:

$H_{o_1}$ : there is no significant treatment effect,

$H_{o_2}$ : there is no significant instructor effect,

$H_{o_3}$ : there is no significant interaction effect (instructor X treatment),

## Date Collection and Treatment

To test the above hypotheses and provide data regarding the dependent variable, the following steps were taken:

1. The Psychology 201 final examination scores and high school GPAs were acquired by the experimenter. Only those subjects whose high school GPAs were available were included in the analysis.
2. ANCOV was used to test the three null hypotheses.
3. Individual item analysis and reliability data for the resulting dependent variable were included in the analysis of the data.

# Chapter IV

## ANALYSIS OF THE DATA

The primary purpose of this study was to determine the effect of student knowledge of course behavioral objectives upon achievement in an introductory psychology course at Oregon State University. A secondary purpose was to determine if there was a difference in achievement between groups taught by different instructors. A third purpose was to determine if there was interaction between the treatments and the instructors. The findings are presented in the following order: Discussion of the Dependent Variable, Statistical Analysis, ANCOV Table, and Conclusion.

### Discussion of the Dependent Variable

Since the dependent measure was of prime importance in this study, it was examined first. The dependent measure was the final examination. There were 100 four-way choice items in the test. While the authors of the test item pool (Atkinson and Ruch, 1979) offered neither validity nor reliability data for the items, each item was referenced both to a page in the text (Hilgard, 1979) and to one of the non-behavioral objectives in the Study Guide (Atkinson and Ruch, 1979). Although no data were available to determine that the measure constructed from the test item pool in fact measured achievement in introductory psychology, an item analysis and an estimate of internal consistency or reliability were provided by the OSU Test Scoring Service. The item analysis considered the total population of students who took the examination and is included in Appendix D. The analysis included a difficulty index and a discrimination index for each item and a reliability score for the whole

test. An understanding of these indices was essential for arriving at a judgment as to the adequacy of this test as a measure of achievement for the study.

The difficulty index was the percentage of test takers who chose the correct answer for a particular item. This index is expressed in decimal form. A difficulty index of 0 meant that no one gave the correct answer, i.e., the item was too difficult. A difficulty index of 1.00 meant that everyone gave the correct response, i.e., the item was too easy. Beekman (1980) offered a guideline for drawing conclusions about the difficulty of test items. He recommended that the difficulty index for an item with four or more choices be between .35 and .85 (p. 11). Two items were far below this range. Most of the items can be said to be of medium difficulty. Yet this one index must be considered in conjunction with the discrimination index.

The discrimination index is a number which represents how well the item discriminated between the high and low scorers. The method used is the point biserial correlation. Like any correlation, the method yields values between +1.00 and -1.00. Generally, the higher the positive number, the better the item has discriminated. This discrimination index can be converted to a t-statistic and then analyzed by a t-test to determine whether or not the particular item discriminated between the high and low scorers. Since it is impossible to assert with 100 percent certainty that an item discriminates, a level of significance must be specified, just as in any hypothesis test. In this instance an $\alpha = .01$ level was chosen. At this level, 98 of the items discriminated. One question, number 69, was a negative discriminator. This meant that lower scoring students gave the correct response more often than higher scoring students.

Another way of considering the usefulness of a test is to estimate test reliability or internal consistency. This estimate answers the question: Does the test measure whatever it measures consistently? The estimate used, a Kudar-Richardson 20, can range

from a low of 0 to a high of +1.00. The higher estimates are more desirable, since this would indicate a test which has a high inter-correlation among the test items. The final examination used as the dependent variable in this study had a reliability of r = +.911 for the total population.

In summary, the dependent measure used in this study had no published validity data. Yet the item analysis indicates that 98 of the 100 items were good discriminators. The difficulty indices indicated that the test was of moderate difficulty. The reliability estimate of +.911 indicated that the items in the test correlated highly with one another. The dependent variable was a test that, with the possible exception of one item, could be used again as a final examination in Psychology 201.

## Statistical Analysis

An analysis of covariance (ANCOV), with high school GPA as the covariant, and adjusted final examination score as the dependent variable, was used to test the hypotheses. Thus, the raw data required for this analysis consisted of GPA and final examination score for each subject. The raw data are presented in Tables 3 through 8.

The hypotheses were as follows:

H1 : There is no significant treatment effect.

H2 : There is no significant instructor effect.

H3 : There is no significant interaction effect.

TABLE 3. High School Grade Point Averages and Final Examination Scores for Instructor 1/Treatment 1 (Behavioral Objectives)

| Student ID Number | GPA | Score | Student ID Number | GPA | Score |
|---|---|---|---|---|---|
| 1 | 3.33 | 74 | 21 | 3.51 | 70 |
| 2 | 3.92 | 93 | 22 | 3.71 | 73 |
| 3 | 2.99 | 54 | 23 | 3.73 | 77 |
| 4 | 3.55 | 61 | 24 | 3.49 | 77 |
| 5 | 3.86 | 82 | 25 | 3.68 | 83 |
| 6 | 2.56 | 56 | 26 | 2.45 | 77 |
| 7 | 3.15 | 64 | 27 | 3.52 | 79 |
| 8 | 3.16 | 53 | 28 | 3.29 | 79 |
| 9 | 3.00 | 67 | 29 | 2.82 | 51 |
| 10 | 3.47 | 67 | 30 | 3.45 | 74 |
| 11 | 3.57 | 85 | 31 | 3.44 | 79 |
| 12 | 3.22 | 94 | 32 | 2.43 | 80 |
| 13 | 2.76 | 76 | 33 | 3.81 | 80 |
| 14 | 4.00 | 87 | 34 | 3.57 | 93 |
| 15 | 3.88 | 89 | 35 | 3.77 | 61 |
| 16 | 3.54 | 68 | 36 | 3.47 | 76 |
| 17 | 3.17 | 51 | 37 | 3.45 | 66 |
| 18 | 3.44 | 71 | 38 | 3.80 | 73 |
| 19 | 2.57 | 58 | 39 | 3.96 | 94 |
| 20 | 3.14 | 43 | 40 | 3.58 | 65 |

TABLE 4. High School Grade Point Averages and Final Examination Scores for Instructor 2/Treatment 1 (Behavioral Objectives)

| Student ID Number | GPA | Score | Student ID Number | GPA | Score |
|---|---|---|---|---|---|
| 1 | 3.12 | 62 | 20 | 3.54 | 79 |
| 2 | 2.94 | 49 | 21 | 2.88 | 70 |
| 3 | 3.83 | 84 | 22 | 2.52 | 63 |
| 4 | 2.89 | 87 | 23 | 2.78 | 56 |
| 5 | 3.42 | 81 | 24 | 3.10 | 78 |
| 6 | 2.94 | 38 | 25 | 3.94 | 83 |
| 7 | 3.34 | 58 | 26 | 3.38 | 68 |
| 8 | 2.50 | 50 | 27 | 3.23 | 56 |
| 9 | 3.72 | 71 | 28 | 2.58 | 63 |
| 10 | 3.32 | 77 | 29 | 3.68 | 74 |
| 11 | 2.84 | 74 | 30 | 2.91 | 57 |
| 12 | 3.54 | 63 | 31 | 3.25 | 80 |
| 13 | 2.53 | 50 | 32 | 2.07 | 46 |
| 14 | 3.05 | 56 | 33 | 3.05 | 62 |
| 15 | 3.67 | 64 | 34 | 3.93 | 89 |
| 16 | 3.15 | 92 | 35 | 3.05 | 70 |
| 17 | 3.16 | 49 | 36 | 3.05 | 53 |
| 18 | 3.43 | 66 | 37 | 3.70 | 78 |
| 19 | 3.29 | 58 | 38 | 3.09 | 52 |

TABLE 5. High School Grade Point Averages and Final Examination Scores for Instructor 1/Treatment 2 (Study Guide)

| Student ID Number | GPA | Score | Student ID Number | GPA | Score |
|---|---|---|---|---|---|
| 1 | 3.11 | 78 | 25 | 3.22 | 58 |
| 2 | 3.36 | 57 | 26 | 3.92 | 83 |
| 3 | 3.77 | 87 | 27 | 2.58 | 69 |
| 4 | 2.70 | 44 | 28 | 3.42 | 91 |
| 5 | 2.88 | 82 | 29 | 2.92 | 82 |
| 6 | 3.51 | 69 | 30 | 3.81 | 85 |
| 7 | 2.55 | 79 | 31 | 2.80 | 52 |
| 8 | 3.21 | 74 | 32 | 4.00 | 92 |
| 9 | 3.83 | 71 | 33 | 3.56 | 69 |
| 10 | 2.52 | 76 | 34 | 3.91 | 80 |
| 11 | 3.28 | 87 | 35 | 3.44 | 60 |
| 12 | 3.93 | 81 | 36 | 3.77 | 76 |
| 13 | 3.40 | 51 | 37 | 3.53 | 85 |
| 14 | 3.35 | 65 | 38 | 3.86 | 89 |
| 15 | 2.89 | 49 | 39 | 3.26 | 48 |
| 16 | 2.91 | 33 | 40 | 3.18 | 79 |
| 17 | 3.29 | 67 | 41 | 3.81 | 75 |
| 18 | 3.85 | 84 | 42 | 3.63 | 74 |
| 19 | 3.44 | 69 | 43 | 3.38 | 68 |
| 20 | 2.91 | 63 | 44 | 3.66 | 56 |
| 21 | 2.64 | 56 | 45 | 3.24 | 73 |
| 22 | 2.46 | 79 | 46 | 2.87 | 69 |
| 23 | 3.31 | 74 | 47 | 3.19 | 79 |
| 24 | 2.59 | 51 | 48 | 3.36 | 72 |

TABLE 6. High School Grade Point Averages and Final Examination Scores for Instructor 2/Treatment 2 (Study Guide)

| Student ID Number | GPA | Score | Student ID Number | GPA | Score |
|---|---|---|---|---|---|
| 1 | 3.42 | 70 | 26 | 3.58 | 60 |
| 2 | 3.74 | 81 | 27 | 3.16 | 45 |
| 3 | 3.78 | 65 | 28 | 3.48 | 53 |
| 4 | 2.87 | 42 | 29 | 3.30 | 51 |
| 5 | 4.00 | 78 | 30 | 2.88 | 74 |
| 6 | 3.73 | 77 | 31 | 3.88 | 68 |
| 7 | 3.50 | 55 | 32 | 3.37 | 69 |
| 8 | 2.98 | 56 | 33 | 3.51 | 58 |
| 9 | 3.51 | 92 | 34 | 3.79 | 82 |
| 10 | 3.56 | 65 | 35 | 2.66 | 49 |
| 11 | 3.91 | 87 | 36 | 2.53 | 57 |
| 12 | 3.09 | 44 | 37 | 3.06 | 55 |
| 13 | 2.63 | 50 | 38 | 3.84 | 83 |
| 14 | 3.33 | 59 | 39 | 3.34 | 69 |
| 15 | 3.24 | 82 | 40 | 2.55 | 45 |
| 16 | 3.82 | 80 | 41 | 2.98 | 58 |
| 17 | 2.58 | 40 | 42 | 3.67 | 69 |
| 18 | 3.55 | 69 | 43 | 2.76 | 56 |
| 19 | 3.88 | 87 | 44 | 3.47 | 63 |
| 20 | 3.63 | 79 | 45 | 2.67 | 77 |
| 21 | 2.27 | 56 | 46 | 3.02 | 58 |
| 22 | 3.71 | 56 | 47 | 3.38 | 49 |
| 23 | 3.28 | 72 | 48 | 3.95 | 87 |
| 24 | 3.26 | 65 | 49 | 2.77 | 71 |
| 25 | 3.22 | 78 | | | |

TABLE 7. High School Grade Point Averages and Final Examination Scores for Instructor 1/Treatment 3 (Weekly Outlines)

| Student ID Number | GPA | Score | Student ID Number | GPA | Score |
|---|---|---|---|---|---|
| 1 | 3.31 | 50 | 25 | 3.72 | 57 |
| 2 | 3.18 | 55 | 26 | 3.22 | 56 |
| 3 | 2.48 | 59 | 27 | 3.52 | 86 |
| 4 | 3.07 | 66 | 28 | 3.82 | 82 |
| 5 | 2.94 | 47 | 29 | 3.35 | 66 |
| 6 | 3.56 | 62 | 30 | 2.42 | 62 |
| 7 | 2.65 | 63 | 31 | 3.02 | 82 |
| 8 | 3.08 | 64 | 32 | 3.14 | 61 |
| 9 | 3.60 | 68 | 33 | 2.98 | 60 |
| 10 | 2.79 | 74 | 34 | 3.43 | 67 |
| 11 | 4.00 | 90 | 35 | 3.02 | 52 |
| 12 | 3.82 | 83 | 36 | 2.82 | 73 |
| 13 | 3.19 | 81 | 37 | 2.78 | 50 |
| 14 | 3.16 | 61 | 38 | 3.07 | 46 |
| 15 | 2.99 | 69 | 39 | 3.76 | 83 |
| 16 | 3.27 | 67 | 40 | 3.40 | 45 |
| 17 | 3.61 | 54 | 41 | 3.33 | 70 |
| 18 | 3.47 | 64 | 42 | 2.93 | 55 |
| 19 | 3.51 | 66 | 43 | 4.00 | 77 |
| 20 | 3.50 | 77 | 44 | 7.87 | 50 |
| 21 | 3.58 | 88 | 45 | 3.58 | 78 |
| 22 | 3.07 | 60 | 46 | 3.30 | 68 |
| 23 | 2.80 | 70 | 47 | 2.80 | 66 |
| 24 | 3.22 | 72 | | | |

TABLE 8. High School Grade Point Averages and Final Examination Scores for Instructor 2/Treatment 3 (Weekly Outlines)

| Student ID Number | GPA | Score | Student ID Number | GPA | Score |
|---|---|---|---|---|---|
| 1 | 3.02 | 60 | 20 | 3.83 | 74 |
| 2 | 3.30 | 85 | 21 | 2.93 | 46 |
| 3 | 2.86 | 57 | 22 | 3.57 | 71 |
| 4 | 3.61 | 78 | 23 | 3.79 | 59 |
| 5 | 2.99 | 56 | 24 | 3.17 | 53 |
| 6 | 3.68 | 80 | 25 | 3.53 | 65 |
| 7 | 3.70 | 89 | 26 | 3.33 | 61 |
| 8 | 2.79 | 71 | 27 | 3.92 | 85 |
| 9 | 2.26 | 27 | 28 | 3.20 | 69 |
| 10 | 2.75 | 56 | 29 | 3.00 | 69 |
| 11 | 2.72 | 57 | 30 | 3.96 | 87 |
| 12 | 3.81 | 69 | 31 | 3.69 | 89 |
| 13 | 3.14 | 69 | 32 | 3.62 | 69 |
| 14 | 3.00 | 77 | 33 | 3.71 | 83 |
| 15 | 3.72 | 79 | 34 | 2.98 | 62 |
| 16 | 3.60 | 58 | 35 | 2.76 | 67 |
| 17 | 3.99 | 92 | 36 | 3.67 | 64 |
| 18 | 2.58 | 79 | 37 | 3.70 | 70 |
| 19 | 3.00 | 79 | | | |

Subjects were randomly assigned to one of three treatments. High school GPA for each subject was obtained from the Office of the Registrar at OSU. Only those students who completed the course and whose GPA was on file were included in the data analysis. Because of the manner in which the raw data were gathered, the number of students in each of the six treatment groups by instructor categories was not uniform. This resulted in an unbalanced 2x3 analysis of covariance design. Data were analyzed using an analysis of covariance model (Netter and Wasserman, 1974).

The analysis of covariance table which follows shows the calculated and table F values and decision regarding the hypotheses.

TABLE 9. Analysis of Covariance Table

| Source of Variation | Adjusted df | Calculated F | Table F | Decision | P Value |
|---|---|---|---|---|---|
| Instructor | 1 | 3.1142 | 3.88 | NSD* | .0788 |
| Treatments | 2 | .5343 | 3.03 | NSD* | .5868 |
| IxT | 2 | 2.5412 | 3.03 | NSD* | .0808 |
| Error | 252 | | | | |
| Total | 258 | | | | |

*No significant difference.

## Conclusion

No significant statistical differences were detected for any of the hypotheses tested. Neither the treatments nor the instructors affected the final examination score sufficiently to result in a rejection of any of the null hypotheses. Each of the null hypotheses was retained. Behavioral objectives, while not significantly helpful in increasing achievement, were not shown to be detrimental.

# Chapter V

## SUMMARY, CONCLUSIONS, OBSERVATIONS, RECOMMENDATIONS

### Summary

A review of the literature of behavioral objectives reveals a divergence of opinion about the effectiveness of behavioral objectives in improving achievement. Early curriculum writers thought that learning objectives should be definite and specific and that objectives should state in behavioral terms what students should be able to do after instruction (Bobbitt, 1918; Washburne, 1922; Tyler, 1950; Taba, 1962). Other advocates maintained that behavioral objectives give direction to students and aid in curriculum design and the assessment of student progress (Armstrong, 1970; Block, 1971; Carroll, 1970; and Popham, 1969). An opposite viewpoint is represented in the writings of Atkin (1968), Ebel (1970) and Eisner (1967), who maintain that behavioral objectives may be detrimental, in that they may fail to meet student needs, while making the published objectives the only ones and substituting achievement of the minimal goals for creative thinking.

The writings of learning theorists and researchers indicate that behavioral objectives may be helpful insofar as they give students an understanding of the structure of the subject in advance and provide an opportunity for practice and review, while fostering an active role on the part of the learner (Bruner, 1960; Gagne and Briggs, 1974; Monroe and Engelhart, 1930; Morgan and Deese, 1957; and Stevens, 1965). The psychological approaches to learning also seem to favor the use of behavioral objectives, since they encourage active learning and a resultant strengthening of stimulus-response bonds, stress the importance of understanding rather than rote learning, and provide for individual differences in learning speed.

This theoretical controversy has not been resolved by empirical research. Of the many studies conducted which have examined the effect of behavioral objectives upon achievement, less than one-half show a significant increase in achievement attributable to student or teacher use of behavioral objectives (Zeman, 1978). The effect of behavioral objectives upon achievement in introductory psychology has not been previously investigated, despite the ubiquity of this popular undergraduate course.

One result of the many studies of the effect of behavioral objectives and the reviews of these studies (Barth, 1974; Duchastel and Merrill, 1973; Hartley and Davies, 1976; Macdonald-Ross, 1973; McNeil, 1969; Melton, 1978; and Walbesser and Eisenberg, 1972) has been some recommendations for more effective use of behavioral objectives. McNeil (1969) and Tyler (1950) suggested that students be given the opportunity to practice the objectives. Bloom (1956) and Huenecke (1970) thought that placement of the objectives within a cognitive taxonomy would increase at least the teacher's range of behaviors, if not the students'. Tyler (1950) and Tiemann (1968) thought that students should be informed that they would be tested on the objectives. Scriven (1977) suggested that a test item pool be developed from the objectives and used as a source of formative and summative evaluations.

This study was designed to incorporate these recommendations in investigating an unanswered question: What is the effect of behavioral objectives upon achievement in introductory psychology?

## Purpose

The primary purpose of this study, then, was to determine the effect of student knowledge of course behavioral objectives upon achievement in introductory psychology at Oregon State University. A secondary purpose was to determine if there was a significant difference in achievement for groups taught by different instructors.

A third purpose was to determine if there was interaction between treatments and instructors.

## Method

The 259 subjects participating in the study were randomly assigned to either experimental or control treatments taught by one of two instructors. The experimental treatments consisted of weekly statements of behavioral objectives and printed instructions concerning the use of these objectives (Appendix A). Control/placebo treatments consisted of weekly course outlines and weekly study guides (Appendix B). High school grade point average was used as the covariant with the final examination (Appendix C) as the dependent measure, with analysis of covariance as the statistical tool. The methodology incorporated recommendations of past researchers and research reviewers: space was left on the sheets of behavioral objectives given to students to encourage student practice of the objectives (McNeil, 1969; Tyler, 1950); the objectives were assigned to their appropriate place in the cognitive taxonomy (Bloom, 1956; Huenecke, 1970); subjects were informed that they would be tested on the objectives (Tiemann, 1968; Tyler, 1950); and a test item pool referenced to the objectives was used as the source for the dependent measure (Scriven, 1977).

## Findings

The results of this study indicate that weekly statements of behavioral objectives given to students in Psychology 201, the introductory psychology course at OSU, had no significant effect upon achievement in psychology as measured by the final examination with GPA as the covariant. The analysis of the data resulted in the retention of each of the null hypotheses:

Ho1: There was no significant achievement difference between students receiving behavioral objectives, outlines or study guides.

Ho2: There was no significant achievement difference between groups taught by different instructors.

Ho3: There was no significant interaction effect (instructor x treatment).

In summary, no statistical advantage was noted which would favor the use of behavioral objectives as they were used in this study.

## Conclusions

While behavioral objectives seem compatible with the major theories of learning and experimental evidence regarding the learning process, the behavioral objectives used in this study were not found to be a significant factor in increasing achievement in this experiment. No significant differences were noted which would favor the use of behavioral objectives over the placebo treatments of study guides or course outlines as a method for increasing achievement in introductory psychology at Oregon State University.

The results of this study, like most others which investigated the effect of student knowledge of behavioral objectives upon achievement, failed to demonstrate that student knowledge of course objectives which were stated in behavioral terms was detrimental to achievement (Boardman, 1970; Booth, 1973; Coleman, 1972; Cook, 1969; Hershamn, 1971; Jordan, 1971; Micek, 1974; Morse, 1972; Okoduwa, 1975; Patton, 1972; Phillips, 1971; Semb, 1972; Tiemann, 1967; Treble, 1974; and Zeman, 1978). This study, like all but one of the sixteen other studies conducted in higher education which examined the achievement effect of behavioral objectives, did not show that

behavioral objectives were detrimental to achievement. The experiments conducted using behavioral objectives in classroom settings in higher education tend to support the conclusion that behavioral objectives when given to college students result either in a significant positive difference in achievement and attitude or in no significant difference. This conclusion holds across fifteen studies in a variety of subject areas from mathematics and the sciences to the social sciences of economics and education. Only one study (Lovett, 1971), which was flawed by a high attrition rate, showed that the use of behavioral objectives was detrimental to achievement.

## Observations

The items in the dependent variable for the most part appear to be at the lower levels of the taxonomy (knowledge and comprehension) rather than being spread across the range from knowledge to evaluation, as were the behavioral objectives developed for the study. Perhaps the incongruity between the behavioral objectives and the dependent variable contributed to the lack of a significant difference.

While this study incorporated the recommendations of past researchers and reviewers, there was no attempt to assess the extent of student use of the behavioral objectives. Thus, the results of this study are limited by the fact that the extent to which students actually used the behavioral objectives is unknown.

The study is also limited by the fact that the sample was drawn from Oregon State University, and generalization beyond that population is not justified.

Retention of the null hypotheses is significant in that the behavioral objectives treatment was not shown to be detrimental to achievement. The evidence to date indicates that behavioral objectives are an educational tool which may be used without detrimental achievement effect.

In addition, while there is no statistical support, one can still postulate that (1) behavioral objectives may have a role in curriculum development and planning; (2) behavioral objectives reveal the curriculum which is often hidden behind course titles or brief course descriptions; (3) behavioral objectives are a way of conceptualizing the curriculum which makes it available to students, other faculty, parents and others with an interest in what is being taught; (4) behavioral objectives permit the addition and deletion of curriculum objectives by opening up the curriculum to input from sources other than the text and instructors of the course.

## Recommendations for Further Study

The following recommendations for further research are based upon the conclusions and observations of this study:

1. Replicate the study with an emphasis upon teacher and student use of the behavioral objectives to include: (a) integrating the objectives into the course by requiring the subjects assigned to the behavioral objectives treatment to perform the objectives as a requirement for a passing grade; (b) designing the recitation part of the course around a discussion of the objectives; (c) using quizzes developed from the test item pool to test mastery of the objectives and to provide feedback throughout the course.
2. Conduct research which uses additional variables, such as year in school, college GPA, academic major and sex, to determine if these variables in combination with behavioral objectives result in a significant difference in achievement in introductory psychology.
3. Conduct research using different course materials in various combinations to determine the most effective combination for increasing achievement in introductory psychology. Possible variables

would include the treatments in this study, the text, the Study Guide and the T.V. lectures.

4. Use a Delphi technique with instructors from the different schools and departments, which require introductory psychology as part of their curriculum for their graduates, to determine which objectives are most appropriate for their students.

5. Use a Delphi technique to determine the relative value of the introductory psychology course objectives by comparing the responses of instructors, former students and professionals in the various fields represented by the students' professional schools.

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# APPENDICES

# APPENDIX A

## Experimental Treatments

(Note: On original student copies, adequate spaces were left for written responses.)

Name _____

I. THE NATURE OF PSYCHOLOGY - Objectives

The objectives below are statements of what you should be able to do after completing this week's work in Psychology 201. Use these objectives as a guide for your activities for the week. The final examination will be referenced to these objectives. Each objective has been assigned to a level of cognitive ability ranging from lowest to highest as follows: Knowledge, Comprehension, Application, Analysis, Synthesis, Evaluation. Practice the objectives keeping in mind the level of thought required. These are not to be regarded as a substitute for a detailed understanding of the material presented but as an aid for your study.

1. COMPREHENSION: Given a list of the following terms and their corresponding definitions, you will be able to correctly match them with 95% accuracy:

| | |
|---|---|
| psychology | interactive explanation |
| neurological approach | social sciences |
| behavioral (S-R) approach | behavioral sciences |
| cognitive approach | personality psychology |
| psychoanalytic approach | clinical and counseling psychology |
| phenomenological approach | school and educational psychology |
| experimental psychology | industrial/engineering psychology |
| physiological psychology | forensic psychology |
| development psychology | research psychology |
| social psychology | developmental explanation |

2. COMPREHENSION: You will be able to distinguish between basic and applied research by writing three sentences correctly stating their definitions and differences.

3. COMPREHENSION: Using the following terms and phrases, you will be able to distinguish between experimental and observational methods of research by writing a coherent and grammatically correct paragraph of less than 250 words.

| | |
|---|---|
| variable | survey method |
| independent variable | test method |
| dependent variable | scientific biography |
| is a function of | case study |
| survey method | reconstructing the biography |
| observational method | longitudinal study |

4. COMPREHENSION: Using the following terms and phrases, you will be able to distinguish between experimentation and correlation by writing a coherent and grammatically correct paragraph of less than 200 words.

| | |
|---|---|
| experimental group | mean |
| control group | tests of the significance of a difference |
| dependent variable | cause-effect relationship |
| independent variable | correlation |
| multivariate design | coefficient of correlation |

5. COMPREHENSION: Given the following list of values, you will be able to correctly match them with a corresponding list of interpretive statements.

r = +1.00
r = -1.00
r = .00
r = + .76
r = - .50

6. KNOWLEDGE: Given a list of the following research methods, you will be able to correctly list one advantage and one disadvantage of each.

observational
survey
test
case history

Name _____

II. BIOLOGICAL BASIS OF BEHAVIOR - Objectives

The objectives below are statements of what you should be able to do after completing this week's work in Psychology 201. Use these objectives as a guide for your activities for the week. The final examination will be referenced to these objectives. Each objective has been assigned to a level of cognitive ability ranging from lowest to highest as follows: Knowledge, Comprehension, Application, Analysis, Synthesis, Evaluation. Practice the objective keeping in mind the level of thinking required. These are not to be regarded as a substitute for a detailed understanding of the material presented but as an aid for your study.

1. COMPREHENSION: Given a list of the following terms and their corresponding definitions, you will be able to correctly match them with 95% accuracy:

| | |
|---|---|
| nerves | synapse |
| neurons | neurotransmitter |
| cell body | central nervous system |
| dendrites | peripheral nervous system |
| axon | somatic system |
| terminal buttons | autonomic system |
| afferent neurons | spinal reflex |
| efferent neurons | effector organs |

2. KNOWLEDGE: Given a drawing of the human brain you will be able to label its parts with the terms given below with 100% accuracy:

| | | |
|---|---|---|
| spinal cord | thalamus | reticular system |
| pituitary gland | cerebrum | corpus callosum |
| hypothalmus | cerebellum | medulla |

3. COMPREHENSION: You will be able to use the following terms to describe a synaptic transmission by writing a gramatically correct and coherent essay of less than 300 words:

| | |
|---|---|
| synaptic junction | neurotransmitter |
| all or none principle | excitatory synapse |
| refactory phase | inhibitory synapse |

4. KNOWLEDGE: Given a drawing of the brain labelled with the following terms--cerebellum, thalamus, hypothalamus, cerebral cortex, limbic system--you will be able correctly to record the functions of these parts on the drawing.

5. COMPREHENSION: Given the following terms, you will be able to match them with their corresponding definitions with 95% accuracy:

| | |
|---|---|
| cerebral cortex | auditory area |
| cerebral hemispheres | frontal association areas |
| frontal lobe | posterior association areas |
| parietal lobe | dominant genes |
| occipital lobe | recessive genes |
| temporal lobe | sex-linked genes |
| central fissure | polygenic transmission |
| lateral fissure | monozygotic |
| motor area | dizygotic |
| somatosensory area | environmental interaction |
| visual area | antagonistic functioning |

6. KNOWLEDGE: Given a drawing of the cerebral cortex you will be able to place the following parts in their correct location.

| | |
|---|---|
| parietal lobe | central fissure |
| occipital lobe | motor lobe |
| temporal lobe | somatasensory area |
| frontal lobe | auditory area |
| lateral fissure | visual area |

7. KNOWLEDGE: Given the following list of nine functions performend by the brain, you will be able to list the functions performed by the right hemisphere in the right column and functions performed by the left hemisphere in the left column:

| | |
|---|---|
| spatial construction | olfaction-right nostril |
| speech | right hand control |
| writing | right visual field |
| olfaction-left nostril | left visual field |
| calculation | |

8. COMPREHENSION: In two complete sentences you will be able to correctly describe the structure and function of the sympathetic nervous system.

9. COMPREHENSION: In two complete sentences you will be able to correctly describe the structure and function of the parasympathetic nervous system.

10. COMPREHENSION: Given the following terms you will be able to correctly match them with their corresponding definitions:

| | |
|---|---|
| endocrine glands | adrenal gland |
| hormones | epinephrine |

pituitary gland
posterior pituitary
anterior pituitary
nerepinephrine
steroids

11. COMPREHENSION: You will be able to distinguish between genes and chromosomes by writing two complete sentences.

12. COMPREHENSION: Given a list of the following chromosomal abnormalities you will be able to correctly write a one-sentence definition for each:

    Turner's syndrome  Klinefelter's syndrome  Down's syndrome

13. APPLICATION: You will be able to write two sentences correctly defining and giving one reason for selective breeding.

14. APPLICATION: You will be able to write two sentences defining twin studies which also list two similarities which have been discovered regarding identical twins.

Name _____

III. PSYCHOLOGICAL DEVELOPMENT - Objectives

The objectives below are statements of what you should be able to do after completing this week's work in Psychology 201. Use these objectives as a guide for your activities for the week. The final examination will be referenced to these objectives. Each objective has been assigned to a level of cognitive ability, ranging from lowest to highest as follows: Knowledge, Comprehension, Application, Analysis, Synthesis, and Evaluation. Practice the objective keeping in mind the level of thinking required. These are not to be regarded as a substitute for a detailed understanding of the material presented, but as an aid for your study.

1. SYNTHESIS: Using the following terms you will be able to compose a gramatically correct essay of less than 200 words explaining the inseparability of heredity and environment:

   newborn infant — language — stimulating environment
   neurological development — culture

2. KNOWLEDGE: You will be able to correctly list two developmental consequences of restricted environments and two developmental consequences of enhanced sensory inputs.

3. KNOWLEDGE: Given this list of Piaget's stages of cognitive development, you will be able to list two characteristics of and the approximate ages for each stage:

   Sensorimotor — Concrete Operational
   Pro-operational — Formal Operational

4. COMPREHENSION: Given the following terms and their corresponding definitions, you will be able to match them with 95% accuracy:

   attachment — adolescent growth spurt
   secondary sex characteristics — secure attachment
   object performance — generativity
   identification — anxious attachment
   puberty — sex role standards
   role confusion — deviant identity

5. KNOWLEDGE: Given the following list of environmental influences upon attachment, you will be able to write two effects of each:

   maternal care  peer interaction  child reacting practices

6. KNOWLEDGE: You will be able to correctly list four factors which influence the development of identification.

7. KNOWLEDGE: You will be able to correctly list three problems faced by late maturers.

8. KNOWLEDGE: You will be able to correctly list three problems faced by early maturers.

9. SYNTHESIS: Given the data in Table 3-3 on page 91 of the text, you will be able to list four conclusions concerning the sexual behavior of adolescents.

10. APPLICATION: Given a list of 6 problems faced by people at different stages in their lives, identify each with one of Erickson's eight stages of psycho-social development.

Name _____

IV. SENSORY PROCESSES - Objectives

The objectives below are statements of what you should be able to do after completing the week's work in Psychology 201. Use these objectives as a guide for your activities for the week. The final examination will be referenced to these objectives. Practice the objectives keeping in mind the level of knowledge required. Each objective has been assigned to a level of cognitive ability ranging from lowest to highest as follows: Knowledge, Comprehension, Application, Analysis, Synthesis, Evaluation. These are not to be regarded as a substitute for a detailed understanding of the material presented but as an aid for your study.

1. COMPREHENSION: Given a list of the following terms and their corresponding definitions, you will be able to match them with 95% accuracy:

| | |
|---|---|
| absolute threshold | monochromat |
| difference threshold | Young-Helmholtz theory |
| Weber's Law | stabilized retinal images |
| j.n.d. | olfactory epithelium |
| rods | equilibratory senses |
| cones | semicircular canals |
| fovea | dark adaptation |
| psychological primaries | rhodopsin |
| achromatic colors | intensity |
| chromatic colors | decibel |
| consonant | vestibular sacs |
| dissonant | kinesthesis |
| timbre | frequency |
| dichromat | |

2. KNOWLEDGE: You will be able to correctly list and define two kinds of thresholds.

3. SYNTHESIS: You will be able to compose a coherent and gramtically correct essay of less than 300 words describing the functioning of the eye given the following terms: light, cornea, pupil, retina, rod, cones, bipolar cells, ganglion cells, optic nerve, occipital lobes, optic chaisma.

4. APPLICATION: You will be able to write three complete sentences which describe recurrent inhibition, after doing the experiment on p. 117 of the text.

5. COMPREHENSION: You will be able to describe in two complete sentences the color mixing of both lights and pigment.

6. KNOWLEDGE: You will be able to correctly draw and label a sound wave with the labels frequency and amplitude.

7. ANALYSIS: In a paragraph of less than 100 words, you will be able to correctly compare the terms hue, brightness and saturation as they relate to color; to the terms pitch, loudness and timbre as they relate to tone.

8. SYNTHESIS: You will be able to write an essay of less than 350 words describing the functioning of the human ear and hearing using the following terms: external ear, auditory canal, ear drum, hammer, anvil and stirrup, oval window,cochlea, basilar membranes, brain cells, organ of Corti, auditory nerve, temporal lobe.

9. EVALUATION: In a paragraph of less than 200 words you will be able to define and evaluate the two theories of hearing.

10. KNOWLEDGE: You will be able to correctly list the four primary and three secondary qualities of taste.

Name _____

V. PERCEPTION - Objectives

The objectives below are statements of what you should be able to do after completing this week's work in Psychology 201. Use these objectives as a guide for your activities for the week. The final examination will be referenced to these objectives. Each objective has been assigned to a level of cognitive ability ranging from lowest to highest as follows: Knowledge, Comprehension, Application, Analysis, Synthesis and Evaluation. Practice the objective keeping in mind the level of thinking required. These are not to be regarded as a substitute for a detailed understanding of the material presented but as an aid for your study.

1. COMPREHENSION: Given a list of the following terms and their definitions you will be able to match them with 95% accuracy.

| | |
|---|---|
| Gestalt | induced motion |
| shape constancy | stereoscopic motion |
| location constancy | binocular disparity |
| brightness and color constancy | perceptual grouping |
| hypothesis testing | visual illusions |
| autokinetic effect | nativist viewpoint |
| phi phenomenon | empiricist viewpoint |
| stroboscopic motion | attention |

2. COMPREHENSION: You will be able to correctly list and give an example of each of the five object constancies.

3. COMPREHENSION: Given the Figure 5-5 on page 113 of the text, you will be able to describe figure and ground in less than four sentences.

4. COMPREHENSION: You will be able to correctly define perceptual hypothesis testing in a complete sentence.

5. COMPREHENSION: You will be able to correctly define analysis by synthesis in a complete sentence.

6. APPLICATION: You will be able to define and give an example of the two types of apparent motion in a paragraph of less than 150 words.

7. APPLICATION: You will be able to correctly list and give an example for each of the monocular cues to depth perception.

8. COMPREHENSION: You will be able to write two sentences defining and giving an example of each of the following: simple cells, complex cells, hypercomplex cells.

9. ANALYSIS: In a coherent and gramtically correct essay of less than 250 words you will be able to contrast and give examples in support of both the nativist and empiricist views of perception.

10. KNOWLEDGE: You will be able to correctly list four physical properties of stimuli and four internal variables which are important in determining which stimulus attracts attention.

11. COMPREHENSION: In two sentences you will be able to define and give an example of an orienting reflex.

12. COMPREHENSION: You will be able to correctly list and give a one-sentence definition for each of the four types of extrasensory phenomena.

13. KNOWLEDGE: You will be able to correctly list two reasons why many psychologists are skeptical about ESP.

Name _____

VII. CONDITIONING AND LEARNING - Objectives

The objectives below are statements of what you should be able to do after completing this week's work in Psychology 201. Use these objectives as a guide for your activities for the week. The final examination will be referenced to these objectives. Each objective has been assigned to a level of cognitive ability from lowest to highest as follows: Knowledge, Comprehension, Application, Analysis, Synthesis and Evaluation. Practice the objectives keeping in mind the level of thinking required. These are not to be regarded as a substitute for a detailed understanding of the material presented but as an aid for your study.

1. COMPREHENSION: Given the following terms and their corresponding definitions you will be able to match them with 95% accuracy.

| | |
|---|---|
| insight | branching program |
| punishment | brain stimulation |
| associative learning | classical conditioning |
| learning | generalization |
| operant conditioning | discrimination |
| cognitive learning | biofeedback |
| extinction | negative reinforcer |
| positive reinforcement | CAL |
| linear program | |

2. SYNTHESIS: Using the following terms you will be able to compose an essay of less than 300 words describing Pavlov's experiments:

| | |
|---|---|
| salivate | conditioned response |
| meat | unconditioned response |
| classical conditioning | conditioned stimulus |
| light | |

3. APPLICATIONS: Using the terms light, meat and salivate you will be able to give an example of each of the following types of conditioning:

simultaneous delayed trace

4. COMPREHENSION: You will be able to distinguish between operant and respondent behavior in two complete sentences.

5. SYNTHESIS: Using the following terms you will be able to compose an essay of less than 200 words explaining operant conditioning.

| | | |
|---|---|---|
| Skinner box | discriminative stimulus | extinction |
| reinforcement | non-reinforcement | |

6. COMPREHENSION: Distinguish between partial reinforcement and conditioned reinforcement by writing four sentences which define each and give a practical significance for each.

7. COMPREHENSION: You will be able to define and give one example for each of two measures of operant strength in four complete sentences.

8. COMPREHENSION: You will be able to define and give one example of shaping operant behavior for animals and one example for human verbal behavior in two short paragraphs.

9. KNOWLEDGE: Given the following reinforcement schedules, you will be able to write a one-sentence definition for each:

| | |
|---|---|
| fixed ratio | variable ratio |
| fixed interval | variable interval |

10. ANALYSIS: You will be able to distinguish between positive reinforcement, negative reinforcement and punishment in a paragraph of less than 200 words.

11. APPLICATION: Given the Figure 7-14 on page 205 of the text, you will be able to interpret the effect of amount of reinforcement and delay of reinforcement.

12. ANALYSIS: You will be able to distinguish between associative and cognitive learning by writing two complete sentences.

13. KNOWLEDGE: You will be able to list three features of CAL which make this type of learning effective.

Name _____

VIII. REMEMBERING AND FORGETTING - Objectives

The objectives below are statements of what you should be able to do after completing this week's work in Psychology 201. Use the objectives as a guide for your activities for the week. The final examination will be referenced to these objectives. Each objective has been assigned to a level of cognitive ability from lowest to highest as follows: Knowledge, Comprehension, Application, Analysis, Synthesis and Evaluation. Practice the objectives keeping in mind the level of thinking required. These are not to be regarded as a substitute for a detailed understanding of the material presented but as an aid for your study.

1. KNOWLEDGE: You will be able to correctly list and define the three stages of memory.

2. KNOWLEDGE: You will be able to correctly list and define the two types of memory.

3. COMPREHENSION: Given the following terms and their corresponding definitions you will be able to match them with 95% accuracy:

| | |
|---|---|
| chunks | proactive interference |
| displacement | mnemonic systems |
| acoustic encoding | key word method |
| visual encoding | method of loci |
| imagery code | stereotypes |
| semantic | schemata |
| retrieval cue | free recall |
| retroactive interference | |

4. COMPREHENSION: You will be able to differentiate between an imagery code and a semantic code by writing four sentences or less.

5. COMPREHENSION: Using the terms storage and retrival you will be able to describe two explanations of forgetting in four sentences or less.

6. KNOWLEDGE: You will be able to list two factors which increase the chances of successful recall.

7. COMPREHENSION: You will be able to distinguish between the two types of interference, by writing two complete sentences.

8. KNOWLEDGE: You will be able to list three emotional factors in forgetting.

9. KNOWLEDGE: You will be able to list and define two encoding methods which can be used to improve memory.

10. KNOWLEDGE: You will be able to list the two factors which increase retrieval.

11. COMPREHENSION: Given the Figure 8-12 on page 241 of the text, you will be able to define and identify the benefit of practicing retrieval.

12. ANALYSIS: In two sentences you will be able to differentiate between retrograde and anterograde amnesia using the terms concussion, surgery, long-term memory and short-term memory.

13. SYNTHESIS: Using the Figure 8-13 on page 243 of the text, compose a short paragraph defining the Atkinson and Shiffrin theory of dual memory.

14. COMPREHENSION: In a short paragraph you will be able to explain the depth of processing theory of memory using the terms: stages, residue, short-term memory, persistence.

15. KNOWLEDGE: You will be able to define constructive memory using the terms inferences, stereotypes, and schemata.

Name _____

IX. LANGUAGE AND THOUGHT - Objectives

The objectives below are statements of what you should be able to do after completing this week's work in Psychology 201. Use these objectives as a guide for your activities for the week. The final examination will be referenced to these objectives. Each objective has been assigned to a level of cognitive ability from lowest to highest as follows: Knowledge, Comprehension, Application, Analysis, Synthesis and Evaluation. Practice the objectives keeping in mind the level of thinking required. These are not to be regarded as a substitute for a detailed understanding of the material presented but as an aid for your study.

1. COMPREHENSION: Given a list of the following terms and their corresponding definitions, you will be able to match them with 95% accuracy.

| | |
|---|---|
| concept | innate |
| typicality | GPS |
| hierarchies of concepts | overextensions |
| hypothesis testing | noun phrase |
| semantic concepts | verb phrase |
| propositions | grammatical morphemes |
| phonemes | computer simulation |
| morphemes | telegraphic utterances |
| imitation | visual thinking |
| conditioning | |

2. COMPREHENSION: You will be able to define a concept in three sentences or less using the terms common properties and typicality.

3. COMPREHENSION: You will be able to write six sentences or less which explain how concepts are acquired by adults and young children using the terms overextension, hypothesis testing and feedback.

4. ANALYSIS: In two sentences you will be able to distinguish between phonemes or morphemes.

5. COMPREHENSION: In a short paragraph you will be able to describe how a sentence is produced and how a sentence is understood.

6. COMPREHENSION: In a short paragraph you will be able to describe a child's progression from primitive to complex sentences.

7. COMPREHENSION: You will be able to explain in a paragraph of less than 250 words the three models which explain how children learn to speak in sentences.

8. ANALYSIS: Give evidence to support your responses to the question: Is language innate?

9. APPLICATION: Given Figures 9-10 and 9-11, on page 273 of your text, you will be able to write four sentences explaining visual thinking.

10. COMPREHENSION: You will be able to explain the stages of problem solving in less than three sentences.

11. COMPREHENSION: You will be able to explain the two basic processes used in GSP by writing a paragraph of less than 100 words.

# APPENDIX B

## Placebo Treatments

Name _____

I. THE NATURE OF PSYCHOLOGY - Weekly Outline

During this week you will be introduced to Psychology. You will be exposed to different conceptual approaches used by psychologists to explain different psychological phenomena. The different fields of psychology will be explained. You will also be introduced to both basic and applied research, including experimentation, observation and correlation. These are not to be regarded as a substitute for a detailed understanding of the material presented but as an aid for your study.

Name _____

THE NATURE OF PSYCHOLOGY - A Study Guide

The items below are things you should study for this week in this course. The final examination will be referenced to these.

1. Study the different conceptual approaches to psychology.
2. Study the different fields of psychology.
3. Study the different research methods.
4. Study the different ways measurement is used in psychology.

These are not to be regarded as a substitute for a detailed understanding of the material presented but as an aid for your study.

Name _____

II. BIOLOGICAL BASIS OF BEHAVIOR - Weekly Outline

During this week you will be introduced to the biological bases of behavior. The parts of the nervous system, the brain, its parts and different functions will be explained. The functions of the right and left hemispheres will be discussed as well as the autonomic nervous system. The various glands of the endocrine system as well as genetic influences upon behavior will also be introduced. This is not to be regarded as a substitute for a detailed understanding of the material presented but as an aid for your study.

Name _____

BIOLOGICAL BASIS OF BEHAVIOR - A Study Guide

The items below are things you should study for this week in this course. The final examination will be referenced to these. These are not to be regarded as a substitute for a detailed understanding of the material presented but as an aid for your study.

1. Study the basic units and organization of the human nervous system.

2. Study the functions and location of the three concentric structures of the brain.

3. Study the location and functions of the different areas of the cerebral cortex.

4. Study the experiments conducted with split-brain subjects.

5. Study the functions and interactions of the autonomic nervous system.

6. Study the functions of the pituitary and adrenal glands.

7. Study the genetic influences upon behavior, including chromosomal abnormalities.

Name _____

III. PSYCHOLOGICAL DEVELOPMENT - Weekly Outline

During this part of the course, you will be introduced to the stages of human development. The early years will be stressed, especially cognitive, social and personality development. The process of identification will be discussed. Adolescence and the development of sexuality will be introduced as well as the concept of psychological development as a life-long process. This is not to be regarded as a substitute for a detailed understanding of the material presented but as an aid for your study.

Name _____

PSYCHOLOGICAL DEVELOPMENT - A Study Guide

The items below are things you should study for this week in this course. The final examination will be referenced to these. These are not to be regarded as a substitute for a detailed understanding of the material presented but as an aid for your study.

1. Study the stages in development.
2. Study the effects of early life experiences upon later development.
3. Study the factors governing development.
4. Study the stages of cognitive development.
5. Study the processes of social development, attachment and interaction.
6. Study the process of identification including sex-role identification.
7. Study the factors influencing identification.
8. Study the different psychological effects of sexual development.
9. Study the changes in sexual standards and behavior in the society.
10. Study the process of seeking identity including role confusion and generation gap.
11. Study the process of human development as a process which continues throughout adulthood.

Name _____

IV. SENSORY PROCESSES - Weekly Outline

During this week you will be introduced to two general properties of the senses. The visual and auditory senses will be examined in detail. The other senses, those of smell and taste, the skin sensations, kinesthesis and the equilibratory senses, will also be considered. This is not to be regarded as a substitute for detailed understanding of the material presented but as an aid for your study.

Name _____

SENSORY PROCESSES - A Study Guide

The items below are the things you should study for this week in the course. The final examination will be referenced to these. These are not to be regarded as a substitute for detailed understanding of the material presented but as an aid for your study.

1. Study the general properties of the senses.
2. Study the visual sense.
3. Study the auditory sense.
4. Study the senses of smell and taste.
5. Study the skin sensations.
6. Study the sensory systems that give us information about the positions and movements of the parts of our bodies.

Name _____

V. PERCEPTION - Weekly Outline

During this week you will be introduced to perception. Perceptual constancies and the perceptual process of organization will be discussed. The influences upon perceptual processes will be introduced. Visual coding and pattern recognition will be considered as well as the role of learning and attentive processes upon perception. Lastly, extrasensory perception will be considered. This is not to be regarded as a substitute for a detailed understanding of the material presented but as an aid for your study.

Name _____

PERCEPTION - Study Guide

The items below are things you should study for this week in this course. The final examination will be referenced to these. These are not to be regarded as a substitute for a detailed understanding of the material presented but as an aid for your study.

1. Study the five perceptual constancies.
2. Study the perceptual organizational processes.
3. Study the three perceptual hypotheses.
4. Study the process of movement perception.
5. Study the process of depth perception.
6. Study visual coding and pattern recognition.
7. Study the role of learning in perception.
8. Study the process of attention and its effect upon perception.
9. Study extrasensory perception.

Name _____

VII. LEARNING AND CONDITIONING - Weekly Outline

During this part of the course you will be intorduced to classical conditioning including the experiments of Pavlov. The laws, examples and interpretations of classical conditioning will be presented. Operant conditioning including the experiments of Skinner will be introduced as well as the principle of reinforcement. Finally, cognitive and individualized learning will be introduced. This is not to be regarded as a substitute for a detailed understanding of the material presented but as an aid for your study.

Name _____

LEARNING AND CONDITIONING - Study Guide

The items below are the things you should study for this week in the course. The final examination will be referenced to these. These are not to be regarded as a substitute for a detailed understanding of the material presented but as an aid for your study.

1. Study Pavlov's experiments.
2. Study the laws of classical conditioning.
3. Study the examples of classical conditioning.
4. Study the classical conditioning principles of generalization and discrimination.
5. Study Skinner's experiments.
6. Study the measures of operant strength.
7. Study partial reinforcement and reinforcement schedules.
8. Study conditioned reinforcement.
9. Study the shaping of behavior.
10. Study the operant conditioning of autonomic responses.
11. Study the principles of reinforcement including brain stimulation and the variables which influence reinforcement.
12. Study cognitive learning including the insight experiments and latent learning.
13. Study individualized learning including CAL and instructional programs.

Name _____

VIII. REMEMBERING AND FORGETTING - Weekly Outline

During the week you will be introduced to the three stages and two types of memory. The operations involved in both long- and short-term memory will be considered. Consideration will be given to improving memory. The relationship between long- and short-term memory will be discussed. Lastly the three processes involved in constructive memory will be examined. This is not to be regarded as a substitute for a detailed understanding of the material presented but as an aid for your study.

Name _____

REMEMBERING AND FORGETTING - Study Guide

The items below are things you should study for this week in the course. The final examination will be referenced to these. These are not to be regarded as a substitute for a detailed understanding of the material presented but as an aid for your study.

1. Study the three stages and two types of memory.
2. Study the processes involved in short-term memory.
3. Study the processed involved in long-term memory.
4. Study how memory can be improved.
5. Study the relationship between long- and short-term memory.
6. Study the processes involved in constructive memory.

Name _____

IX. LANGUAGE AND THOUGHT - Weekly Outline

During this week you will be introduced to concepts. The process of communicating thoughts will be considered. The development of language, including the process of learning language will be discussed. Visual thinking will be examined. Lastly the process of problem solving and computer simulation will be considered. This is not to be regarded as a substitute for a detailed understanding of the material presented but as an aid for your study.

Name _____

LANGUAGE AND THOUGHT - Study Guide

The items below are the things you should study for this week in the course. The final examination will be referenced to these. These are not to be regarded as a substitute for a detailed understanding of the material presented but as an aid for your study.

1. Study the nature of concepts.
2. Study the concept of typicality.
3. Study the process of acquiring concepts.
4. Study the process of communicating thoughts.
5. Study the process of mastering a language.
6. Study the process of and experiments in visual thinking including visual creativity.
7. Study problem solving and computer simulation.

# APPENDIX C

## Dependent Variable

FINAL EXAM

Form G

Psychology 201 Winter 1981

Use FINAL side of the answer sheet. Use a #2 pencil. Include your name, your section number with two digits, and your social security (student I.D.) number. After INST write your recitation instructor's name, and after CLASS write the day and hour of your recitation. On this exam booklet, in the upper right-hand corner, print your name.

Read each item. Select the BEST answer from those offered. On the answer sheet labeled FINAL fill in the answer. Fill in only once for each question. Do not write anything elsewhere on your answer sheet.

Turn in BOTH this question booklet and answer sheet as you leave.

1. Evidence gained from experimentation is referred to as:

   a. correlational
   b. empirical
   c. longitudinal
   d. statistical

2. The _____ approach to the study of human beings is particularly concerned with the relationship between behavior and experience and brain activity.

   a. behavioral
   b. cognitive
   c. psychoanalytic
   d. neurobiological

3. When the experimental method is used, only the _____variable is allowed to vary across different groups of subjects.

   a. independent
   b. dependent
   c. quantitative
   d. observed

4. A synapse can best be described as a(n)

   a. afferent receptor
   b. junction between neurons
   c. single cell
   d. nervous impulse

5. You jerk your hand away after touching a hot plate. The jerk of the muscles was due to nerve impulses from

   a. the sympathetic system
   b. afferent neurons
   c. the parasympathetic system
   d. efferent neurons

6. There are convolutions on the cortex of an 8-month fetus, but not in the case of a 6-month fetus. This information comes from

   a. microanalytic comparisons
   b. neuroregulator comparisons
   c. ontogenetic comparisons
   d. phylogenetic comparisons

7. Maturation refers to

   a. orderly changes in behavior that are caused by experience
   b. changes in behavior that result from training
   c. natural physical growth processes that are relatively independent of environmental events
   d. the acquisition of adult behavior through social contact

8. Piaget's four stages of cognitive development do not include

   a. concrete operations
   b. preformal operations
   c. preoperational
   d. sensorimotor

9. Mr. Henderson, who is 75 years old, feels he has coped successfully with life's problems. According to Erikson, Mr. Henderson will experience a feeling of

   a. integrity
   b. despair
   c. generativity
   d. self-absorbtion

10. After ten minutes in a dark room, a subject still does not see a green light. The most likely explanation is that

    a. there was sufficient time for dark adaption
    b. light intensity is below the absolute threshold
    c. the rods have not been stimulated
    d. the light is outside the visible spectrum

11. The value at which a stimulus is perceived 50 percent of the time is defined as the

    a. absolute threshold
    b. just noticeable difference
    c. difference threshold
    d. psychophysical threshold

12. The _____ is the minimum amount of stimulation required to distinguish one stimulus from another.

    a. absolute threshold
    b. psychophysical function
    c. difference threshold
    d. absolute difference

13. A prism separates white light into its component parts by taking incoming light rays and

    a. saturating them
    b. intensifying them
    c. focusing them
    d. bending them

14. Light entering the human eye first passes through the

    a. cornea
    b. lens
    c. pupil
    d. aqueous humor

15. A person born without any rods would be able to see

    a. nothing
    b. black and white and colors
    c. only black and white
    d. better in dim light than in bright light

16. Mixing together blue and yellow paints produces

    a. green
    b. rod
    c. neutral gray
    d. purple

17. Recent research suggests that the reason we can see an object even after staring at it is that

    a. the image is stabilized on the retina by the lens
    b. new areas of the retina are always being stimulated
    c. the intensity of illumination remains constant
    d. bipolar cells link together rods and cones

18. The ear responds to changes in

    a. the spectrum
    b. electromagnetic energy
    c. radio waves
    d. atmospheric pressure

19. Loudness of a tone is most strongly related to the _____ of the sound

    a. amplitude
    b. frequency
    c. width
    d. pitch

20. Timbre is to sound as _____ is to color

    a. hue
    b. light
    c. saturation
    d. brightness

21. The part of the ear that connects with the auditory nerve is the

    a. eardrum
    b. oval window
    c. eustachian tube
    d. organ of Corti

22. The sense organ whose receptors connect to the brain without synapses is the

    a. eye
    b. tongue
    c. nose
    d. ear

23. Taste buds are found in small number in the

    a. eustachian tubes
    b. pharynx
    c. cortex
    d. olfactory epithelium

24. Cold receptors in the skin respond to

    a. low temperatures only
    b. both low and intermediate temperatures
    c. both high and low temperature
    d. low, intermediate, and high temperatures

25. The sensory system of kinesthesis is responsible for giving us information about

    a. position and movement of body parts
    b. body equilibrium and balance
    c. body temperature
    d. light intensity

26. For which of the following is there no sensory receptor in the human body?

    a. pressure
    b. ultraviolet radiation
    c. spectral radiation
    d. kinesthesis

27. "The detection of physical energy in the environment, transduction to neural action, and transmission to the brain" defines

    a. apperception
    b. attention
    c. perception
    d. sensation

28. You put on your overshoes and march from the outer ear through the middle ear to the inner ear. Of the following which did you see first?

a. auditory ossicles
b. hair cells
c. organ of corti
d. pinna

29. In TV lecture, Smotherman mentioned three major causes of deafness. He did not mention

a. conduction deafness
b. disuse deafness
c. nerve deafness
d. stimulation deafness

30. If a subject were shown a lemon that had been made to reflect mostly blue light, he or she would probably call it yellow if

a. it were moved farther away
b. it were viewed through a narrow opening
c. he or she were told it is a lemon
d. it were turned on its end

31. A person who sees an object in the sky and says, "That's either a small bird just overhead or an airplane very far away," is making a statement about

a. size constancy
b. brightness constancy
c. shape constancy
d. location constancy

32. One of the first visual perceptions made by formerly blind individuals is

a. size constancy
b. brightness constancy
c. figure-ground perception
d. depth perception

33. Which of the following does <u>not</u> describe a figure-ground relationship?

a. a storm-tossed sea
b. the wail of a siren against a background of other street noises
c. a kite 500 feet up in the sky
d. a flower in the grass

34. Visual illusions remind us that

a. retinal size is as important as object size
b. there is a tendency to see familiar objects as being constant
c. we perceive objects rather than features
d. perceptual mechanisms may distort reality

35. Our responses to a figure like the Necker cube make us realize that perception

    a. is based on biocular vision
    b. is a one-dimensional process
    c. is a random process
    d. involves active hypothesis testing

36. In order not to be subject to ____, pilots flying at night might line up a beacon with the edge of a windshield.

    a. the phi phenomenon
    b. the autokinetic effect
    c. stroboscopic motion
    d. induced movement

37. If a flower is drawn larger than a tree, the tree will seem to be

    a. stereoscopic
    b. moving backward
    c. farther away
    d. three-dimensional

38. Two vertical lines with different locations will activate different _____ cells but the same _____ cells.

    a. retinal, cortical
    b. simple, complex
    c. complex, simple
    d. optic nerve, cortical

39. Which cell type responds to imput from all of the others?

    a. hypercomplex cell
    b. complex cell
    c. simple cell
    d. retinal cell

40. A woman blind from birth has had her vision restored. At first she will not be able to

    a. see a cloud against the sky
    b. follow a roller skater with her eyes
    c. scan the objects in the room
    d. distinguish a knife from a pen by sight

41. Apparently, early exposure to a certain amount of light stimulation is important for

    a. learning figure-ground perception
    b. normal neural development
    c. innate visual ability
    d. color discrimination

42. Which of the following would be the most likely response of a 13-month-old child placed on the deep side of a visual cliff?

a. a fall to the bottom
b. sleep
c. backing away
d. active play

43. The experience of being able to tell someone what temperature the weatherman reported even though you were unaware the television was turned on shows that

a. the brain is always active
b. hearing and seeing involve different neural pathways
c. memory involves the stimulation of hypercomplex cells in the brain
d. some stimuli register without attending to them

44. People who say they can bend metal rods without touching them are claiming to have

a. telepathic ability
b. precognition
c. psychokinetic ability
d. clairvoyance

45. One of the main reasons there is skepticism about the existence of ESP is that

a. results depend on the mood of the subject
b. so few people possess the ability
c. people are unwilling to believe in the occult
d. there are no reliable demonstrations of it

46. "The process of assembling sensations into a usable mental representation of the world" is

a. continuation
b. free association
c. perception
d. transduction

47. Dr. Smotherman said, "The whole is different from, and typically greater than, the sum of its parts." This quotation pertains most closely to

a. Freud
b. Gestalt
c. Skinner
d. Watson

48. Perception is

a. a constant receptivity
b. a mirroring of sensory information of varied types

c. a search for the precept which best integrates sensory data
d. a static process

49. When an artist, like Escher, uses pictorial depth cues, he does not use

a. lens accommodation
b. linear perspective
c. overlap or interposition
d. relative size

50. Learning may be defined as

a. success at mastering academic subjects
b. a relatively permanent change in behavior that results from experience
c. the acquisition of a new skill
d. an immediate improvement in performance

51. Classical conditioning represents a very simple form of _____ learning.

a. associative
b. cognitive
c. latent
d. operant

52. If a particular fire alarm is regularly triggered as a "false alarm" prank, the fire fighters may eventually not act at all on alarms from that area. What conditioning principle would they be exhibiting?

a. reinforcement
b. generalization
c. extinction
d. fixed interval discrimination

53. In establishing a conditioned _____, one stimulus is reinforced while similar stimuli are not.

a. generalization
b. acquisition
c. reinforcer
d. discrimination

54. Operant behavior is

a. reflexive
b. respondent
c. spontaneous
d. a reaction to a stimulus

55. In operant conditioning the response is

a. elicited by the unconditioned stimulus
b. elicited by the conditioned stimulus
c. directly related to the reinforcing stimulus
d. made more likely by the discriminative stimulus

56. In operant conditioning, bar pressing that is not _____ will undergo _____.

a. useful, discrimination
b. respondent, extinction
c. reinforced, extinction
d. cumulative, generalization

57. Partial reinforcement

a. refers to shaping behavior by rewarding any part of the desired response
b. refers to rewarding the desired response only some of the time
c. is the most effective method of extinguishing a response
d. has little practical application in learning

58. A dog has been rewarded with a biscuit and a pat on the head each time it rolls over. It continues to do this trick when only the pat on the head is given. This is an example of

a. a fixed-interval schedule
b. a partial reinforcement
c. a stimulus=response linkage
d. conditioned reinforcement

59. In _____, the desired response is obtained by reinforcing all behaviors that gradually approximate the desired response.

a. discrimination learning
b. generalization
c. conditioned reinforcement
d. shaping

60. In discriminating between positive and negative reinforcers, we note that the probability of a response is

a. increased by the termination of a negative reinforcer
b. decreased by the termination of a negative reinforcer
c. increased by the termination of a positive reinforcer
d. decreased by the presentation of a positive reinforcer

61. The ideal conditions for learning, in terms of both amount and timing of reinforcement, are

a. larger amount, delayed reinforcement
b. smaller amount, immediate reinforcement
c. larger amount, immediate reinforcement
d. smaller amount, delayed reinforcement

62. The "aha" experience refers to _____ learning.

a. sign
b. latent
c. operant
d. insight

63. According to Tolman, learning may not be evident until rewards motivate the animal to

a. think
b. perform
c. develop a map
d. interpret the situation

64. The ability to take different paths through a curriculum is a specific feature of

a. linear programs
b. programmed texts
c. instructional programs
d. branching programs

65. In Pavlov's conditioning model, what is the conditioned stimulus to salivation?

a. anxiety
b. buzzer
c. meat powder
d. white rat

66. Pavlov developed experimental neurosis in dogs by giving them an impossible task in

a. discrimination
b. elicitation
c. extinction
d. generalization

67. To secure extinction in classical conditioning, the experimenter must present

a. conditioned stimulus alone
b. unconditioned stimulus alone
c. CS and UCS together
d. neither CS nor UCS

68. Shaping is an important concept in

a. classical conditioning
b. operant conditioning
c. both classical and operant conditioning
d. neither classical nor operant conditioning

69. The most economical way to establish an operant response is the use of

a. continuous reinforcement
b. interval reinforcement
c. ration reinforcement
d. no reinforcement

70. Stimuli similar to the conditioned stimulus tend to elicit a conditioned response to a lesser degree. This phenomenon is called

a. discrimination
b. extinction
c. generalization
d. spontaneous recovery

71. In operant conditioning, the cause of behavior change are events occurring

    a. before the response
    b. during the response
    c. after the response
    d. regardless of the timing

72. The schedule of operant reinforcement which produces behavior most resistant to extinction is

    a. continuous
    b. fixed interval
    c. fixed ratio
    d. variable ratio

73. Humans communicate by combining _____ into complex thoughts and transmitting representations to others.

    a. concepts
    b. events
    c. objects
    d. actions

74. When a symbol stands for a class of events or objects with common properties, we say it refers to a

    a. concept
    b. determiner
    c. noun phrase
    d. preposition

75. Which of the following concepts are in hierarchical order?

    a. animal, plant, stone
    b. plant, grain, wheat
    c. dog, collie, mammal
    d. flower, rose, orchid

76. A major bias in hypothesis testing is the tendency to fail to check

    a. all cases that might refute the hypothesis
    b. any cases that might refute the hypotheses
    c. cases that might support the hypotheses
    d. atypical cases

77. Which of these sentences expresses a proposition different from the others?

    a. The man bit the dog.
    b. It was the dog who was bitten by the man.
    c. It was the man who bit the dog.
    d. The man was bitten by the dog.

78. When phonemes are combined according to the rules of a language, they usually form

a. words
b. phrases
c. propositions
d. grammatical morphemes

79. At about _____ to _____ months, children begin to utter single words that refer to specific things with which they have had contact.

a. 1, 3
b. 6, 8
c. 24, 30
d. 12, 18

80. If a young child's language competence is not sufficient to produce the adult sentence, "The big dog is running on the beach," she would probably say,

a. "The big"
b. "dog running"
c. "is on"
d. "the beach"

81. Which is an example of overgeneralization?

a. saying "brought" for "bought"
b. saying "bwought" for "brought"
c. saying "bait" for "bought"
d. saying "brang" for "brought"

82. Motherese is

a. sign language used by chimps to communicate with their babies
b. baby talk from mothers like "Did baby poopie in his dipie?"
c. simpler, slower talk used by mothers when communicating to youngsters
d. informal gestures and body language to communicate maternal affection towards offspring

83. Washoe used a rocking motion of her crossed arms for human babies and dolls but also for a toy car. This behavior

a. shows that chimpanzees lack concepts
b. suggests mastery of the concept "baby"
c. shows a human-like overgeneralization
d. is an example of "motherese"

84. When subjects were given pairs of names of states in the United States and asked to rate the pairs according to similarity of their shapes, they were

a. quite successful, showing they could generate good images of outlines
b. reasonably successful, but tended to rate states with identical initial letters as similar
c. moderately successful, but tended to rate states with "New" in their names as similar
d. not very successful

85. Those who use the technique of computer simulation claim that

a. the brain is wired like a computer
b. since humans created the computer, it must reflect our minds
c. magnetic memory cores correspond to brain cells
d. the function and organization of the brain is like a computer program

86. Newell and Simon's General Problem Solver is based on two processes: _____ and _____.

a. setting subgoals, reducing discrepancies
b. ends-means analysis, program planning
c. visualization, verbalization
d. top-down solution, down-top programming

87. Which of these is usually used to code verbal material in short-term memory?

a. a visual code
b. an imagery code
c. a semantic code
d. an acoustic code

88. When an item is displaced from short-term memory, we can retrieve it from short-term memory by

a. trying to recall the context in which the learning took place
b. using both auditory and visual cues
c. using appropriate mnemonic devices
d. none of the above, since the loss from short-term memory is permanent

89. Marian the Librarian cannot remember the call number of the book while she tries to file the reference card in an alphabetical file. Why?

a. the alphabet was held in long-term memory, while the call number was in short-term memory
b. alphabetizing and retaining the call number competed for the same resources in short-term memory

c. the alphabet contains more than seven letters
d. the call number displaced the alphabet in long-term memory

90. You hear the sentence "Mary gave John the book." When asked a few minutes later, which of these sentences would you probably say was the one you heard?

a. John gave Mary the book
b. Mary gave the book to John
c. Mary will give John the book
d. John and Mary lost the book

91. Which of these experiences suggests that poor memory reflects failure in retrieval?

a. you forgot the phone number you looked up yesterday
b. your teacher's name is on the top of your tongue but you cannot remember it
c. you do not remember even reading about an item that appears on an exam
d. you make incorrect inferences about a person you met long ago

92. When material previously learned interferes with the recall of something newly learned, _____ had occurred.

a. retroactive interference
b. repression
c. encoding
d. proactive interference

93. When unacceptable memories become inaccessible to conscious awareness. _____ is said to have occurred.

a. proactive inhibition
b. retroactive inhibition
c. repression
d. encoding failure

94. We are least likely to improve our memory by improving our

a. retrieval process
b. storage of information in long-term memory
c. capacity for items in short-term memory
d. encoding

95. Memorization with the help of mental imagery

a. produces better eidetic imagery
b. increases the capacity of our short-term memory
c. leads to more efficient encoding and retrieval
d. reduces the negative effect of anterograde amnesia

96. Why does expanding on the meaning of new material help us remember it?

    a. it provides contextual cues for recall
    b. it helps us encode the material more deeply and elaborately
    c. it prevents the material from being displaced in short-term memory
    d. it increases the probability that the material will be acoustically coded

97. The memory disturbance named anterograde amnesia has provided evidence that

    a. emotional factors may cause forgetting
    b. recognition is an easier task than recall
    c. constructive memory leads to distortion
    d. two different kinds of memory exist

98. Material held in short-term memory

    a. is limited to about ten bits of information
    b. is organized into mental images
    c. must be rehearsed or it will be eventually displaced
    d. will be transferred to long-term memory unless we actively prevent it

99. In one variation of a free-recall experiment, subjects were presented words either slowly or quickly. In terms of amount of recall, the slow-presentation group did

    a. worse because they could not retain the items in short-term memory
    b. better because they had more time to rehearse
    c. worse because the fast group had to organize the list to recall it
    d. better because they were able to produce larger chunks for short-term memory

100. Which of these tasks would be least likely to involve constructive memory?

    a. recalling what happened at a party you recently gave
    b. recalling how to thread a new sewing machine that is quite different from your present one
    c. recalling a eries of unrelated words in a quiet laboratory setting
    d. recalling the details of a novel you had recently read

We hope you have a good vacation!

# APPENDIX D

## Item Analysis

Course: Psychology 201 Mean = 68.51 Standard Deviation = 13.89

| Question Number | Difficulty Index | Discrimination Index | T-values |
|---|---|---|---|
| 1 | .67 | .24 | 5.477** |
| 2 | .47 | .16 | 3.684** |
| 3 | .71 | .13 | 3.010** |
| 4 | .93 | .34 | 8.158** |
| 5 | .42 | .26 | 5.860** |
| 6 | .32 | .27 | 6.343** |
| 7 | .76 | .29 | 6.808** |
| 8 | .86 | .29 | 6.698** |
| 9 | .63 | .37 | 8.950** |
| 10 | .68 | .20 | 4.488** |
| 11 | .73 | .36 | 8.534** |
| 12 | .87 | .44 | 10.857** |
| 13 | .79 | .39 | 9.409** |
| 14 | .81 | .25 | 5.798** |
| 15 | .45 | .36 | 8.594** |
| 16 | .78 | .17 | 3.796** |
| 17 | .68 | .48 | 12.155** |
| 18 | .85 | .27 | 6.169** |
| 19 | .78 | .39 | 9.424** |
| 20 | .58 | .45 | 11.082** |
| 21 | .67 | .44 | 10.765** |
| 22 | .73 | .33 | 7.796** |
| 23 | .63 | .21 | 4.812** |
| 24 | .49 | .26 | 5.985** |
| 25 | .76 | .37 | 8.937** |
| 26 | .70 | .32 | 7.497** |
| 27 | .67 | .32 | 7.417** |
| 28 | .32 | .29 | 6.824** |
| 29 | .70 | .26 | 6.061** |
| 30 | .78 | .13 | 2.835** |
| 31 | .75 | .35 | 8.422** |
| 32 | .76 | .42 | 10.300** |
| 33 | .45 | .25 | 5.767** |
| 34 | .61 | .32 | 7.509** |
| 35 | .79 | .48 | 12.161** |
| 36 | .58 | .30 | 6.879** |

| Question Number | Difficulty Index | Discrimination Index | T-values |
|---|---|---|---|
| 37 | .98 | .23 | 5.183** |
| 38 | .50 | .39 | 9.399** |
| 39 | .58 | .40 | 9.561** |
| 40 | .84 | .35 | 8.426** |
| 41 | .59 | .38 | 9.133** |
| 42 | .88 | .43 | 10.665** |
| 43 | .89 | .39 | 9.369** |
| 44 | .89 | .41 | 10.072** |
| 45 | .72 | .23 | 5.222** |
| 46 | .79 | .41 | 9.876** |
| 47 | .81 | .38 | 9.189** |
| 48 | .51 | .37 | 8.852** |
| 49 | .67 | .39 | 9.331** |
| 50 | .93 | .35 | 8.257** |
| 51 | .81 | .45 | 11.034** |
| 52 | .70 | .30 | 6.877* |
| 53 | .75 | .33 | 7.736** |
| 54 | .42 | .31 | 7.206** |
| 55 | .07 | .21 | 4.706** |
| 56 | .93 | .34 | 7.931** |
| 57 | .88 | .33 | 7.880** |
| 58 | .57 | .24 | 5.467** |
| 59 | .73 | .39 | 9.326** |
| 60 | .74 | .21 | 4.733** |
| 61 | .54 | .23 | 5.275** |
| 62 | .69 | .45 | 11.267** |
| 63 | .67 | .18 | 4.987** |
| 64 | .84 | .29 | 6.646** |
| 65 | .58 | .48 | 12.044** |
| 66 | .59 | .27 | 6.347** |
| 67 | .64 | .42 | 10.387** |
| 68 | .58 | .45 | 11.311** |
| 69 | .18 | -.10 | -2.252* |
| 70 | .73 | .38 | 9.178** |
| 71 | .66 | .38 | 9.127** |
| 72 | .41 | .36 | 8.643** |
| 73 | .87 | .33 | 7.719** |
| 74 | .74 | .34 | 8.004** |
| 75 | .65 | .29 | 6.789** |
| 76 | .55 | .33 | 7.646** |
| 77 | .86 | .23 | 5.249** |
| 78 | .59 | .21 | 4.724** |

| Question Number | Difficulty Index | Discrimination Index | T-values |
|---|---|---|---|
| 79 | .75 | .21 | 4.674** |
| 80 | .97 | .21 | 4.742** |
| 81 | .51 | .18 | 4.013** |
| 82 | .65 | .35 | 8.257** |
| 83 | .71 | .29 | 6.750** |
| 84 | .45 | .34 | 7.923** |
| 85 | .82 | .34 | 7.971** |
| 86 | .66 | .39 | 9.494** |
| 87 | .82 | .46 | 11.404** |
| 88 | .71 | .46 | 11.358** |
| 89 | .66 | .34 | 7.899** |
| 90 | .91 | .22 | 5.108** |
| 91 | .73 | .45 | 11.225** |
| 92 | .61 | .35 | 8.268** |
| 93 | .84 | .49 | 12.330** |
| 94 | .74 | .25 | 5.670** |
| 95 | .87 | .31 | 7.173** |
| 96 | .68 | .41 | 9.897** |
| 97 | .61 | .44 | 10.767** |
| 98 | .83 | .32 | 7.564** |
| 99 | .65 | .38 | 9.030** |
| 100 | .55 | .22 | 4.897** |

*Significant at the .05 confidence level.

**Significant at the .01 confidence level.

# APPENDIX E

## Adjusted Means

ADJUSTED MEANS

(Adjusted for Covariant, GPA)

| | Treatment | | | |
|---|---|---|---|---|
| Instructor | 1 | 2 | 3 | |
| 1 | 71.03 | 70.55 | 66.93 | 69.50 |
| 2 | 67.58 | 64.79 | 68.67 | 67.01 |
| | 69.30 | 67.67 | 67.80 | |

where Treatment 1 = behavioral objectives

Treatment 2 = study guides

Treatment 3 = weekly outlines